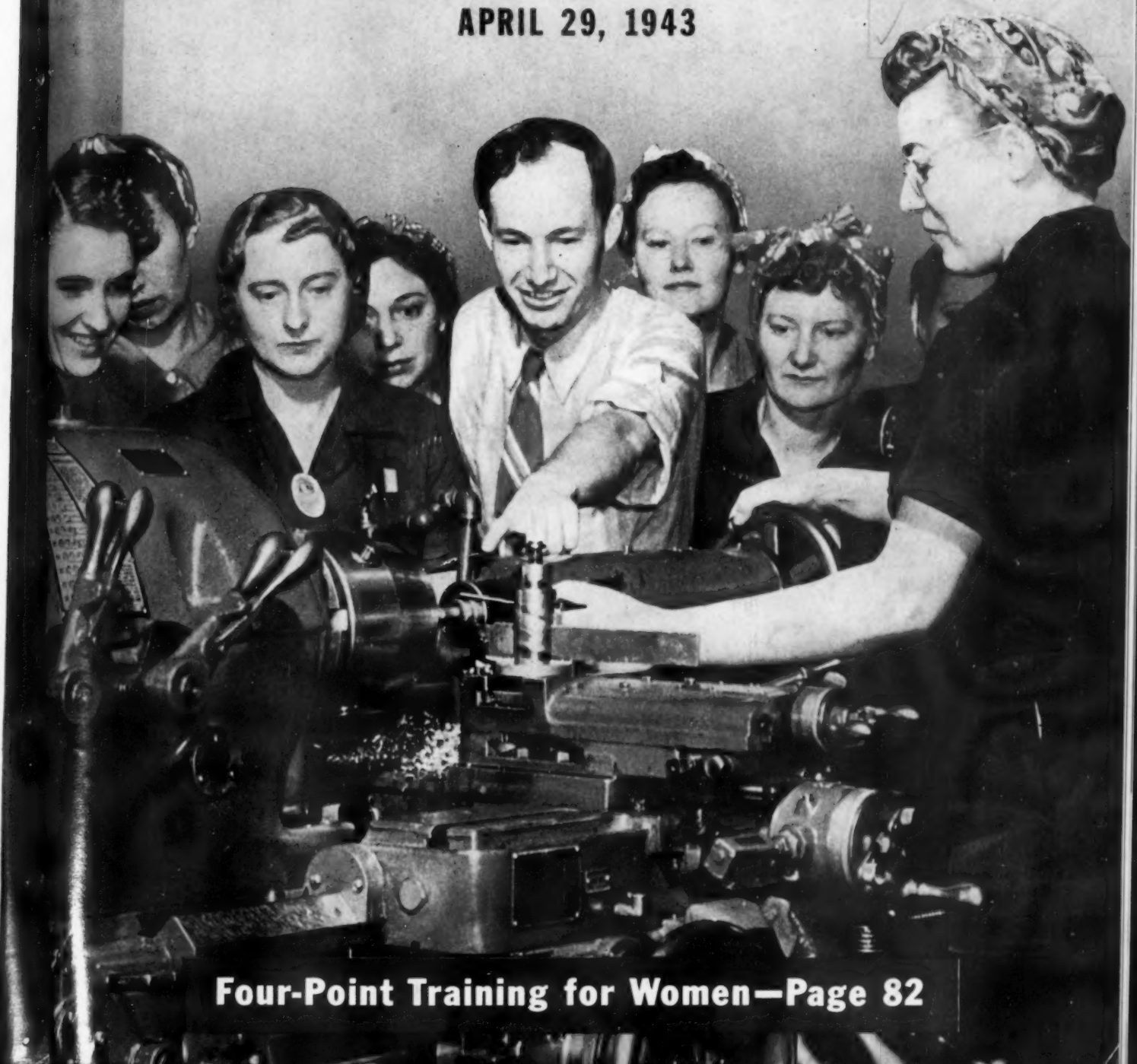
NOLOGY DEPT.

AMERICAN MACHINIST

APRIL 29, 1943

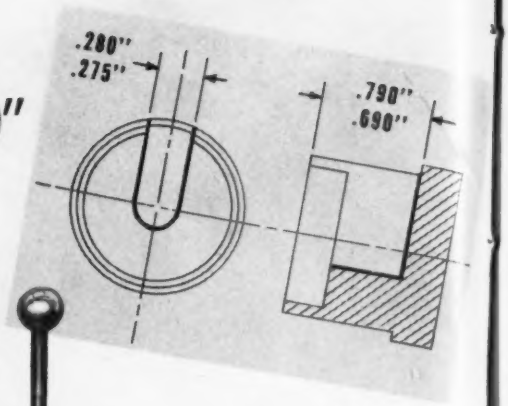
MAY 1943

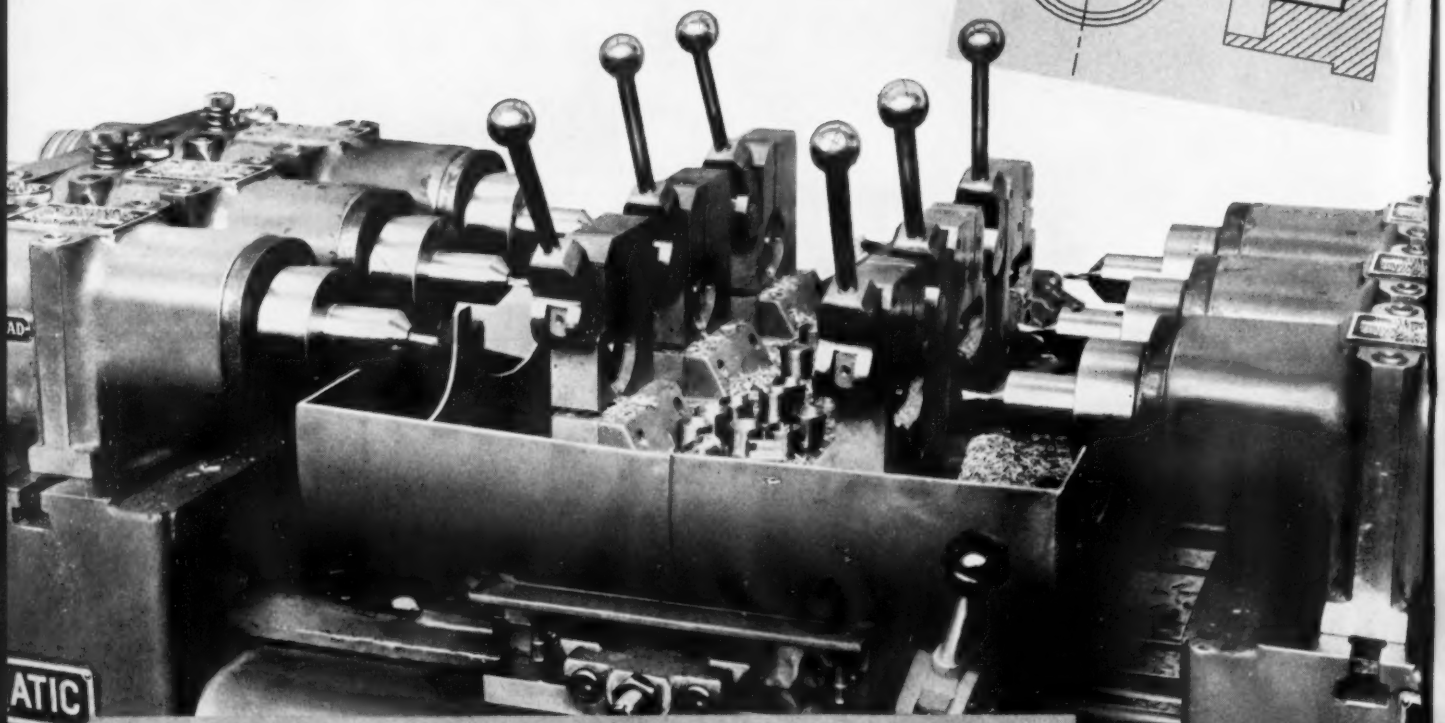


Four-Point Training for Women—Page 82

JUST 6 SECONDS

To Finish a .280" x .690" Slot from the Solid





Heald Bore-Matic *plus* Heald tooling boosts production to *600 per hour* on shell fuse parts

Finishing a slot .280" wide x .690" deep from the solid is ordinarily a comparatively slow process . . . too slow in fact to produce brass shell fuse parts requiring this operation in the huge quantities needed today. Heald field engineers when called in on the job recommended, not a battery of machines, but the single compact Heald Bore-Matic shown above. This Bore-Matic is a No. 49 machine, double-end, with six boring heads carrying end-mills and a six station fixture mounted on a hydraulic cross-slide used for feeding in a side cut. Three fuse parts are slotted simultaneously, three others being loaded meanwhile. Production is 600 per hour, entirely meeting the customers' requirements. Such high production is obtained with a standard Heald Bore-Matic, all units being standard with the exception of tools and fixture. And this job is not an isolated case. Every day Heald Engineering works out equally successful arrangements for getting out more work with more precision. Let's get to work now on your problems in precision boring, turning, facing, chamfering and grooving. Write, phone, or wire us today.

THE HEALD MACHINE CO. WORCESTER, MASS. U. S. A.

MANUFACTURERS OF PRECISION BORING AND PRECISION GRINDING MACHINES

AMERICAN MACHINIST

April 29, 1943

BURNHAM FINNEY Editor and Publisher
W. E. KENNEDY, General Manager
JOHN HAYDOCK, Managing Editor

Associate Editors
WILLIAM J. HARGEST RUPERT LE GRAND
B. C. BROSHEER (Chicago)

Assistant Editors
LAURANCE C. MESSICK DAVID KERR
E. C. HAINES

Washington Bureau
PAUL WOOTON, Chief
BLAINE STUBBLEFIELD ROBERT COLBORN

FRED H. COLVIN, Editor Emeritus
KENNETH H. CONDIT, Consulting Editor

District Managers: F. S. Weatherby, Boston; J. A. McGraw, New York; B. M. Hilberts, Philadelphia; Ray Deen, Chicago; P. F. Pritchard, Chicago; John Koch, Cleveland; R. H. Anderson, Cincinnati; T. A. Rogers, Detroit.

McGraw-Hill Publishing Company, Inc.

James H. McGraw, Founder and Honorary Chairman; James H. McGraw, Jr., President; Howard Ehrlich, Executive Vice-President; Mason Britton, Vice-President; B. R. Putnam, Treasurer; Joseph A. Gerardi, Secretary; J. E. Blackburn, Jr., Director of Circulation. Editorial and Executive offices, 330 West 42nd Street, New York, N. Y. Publication office, 99-129 North Broadway, Albany, N. Y. Branch offices: Chicago, 520 North Michigan Ave.; San Francisco, 68 Post Street; Los Angeles, 601 W. Fifth Street; Aldwych House, Aldwych, London, W. C. 2; Washington; Philadelphia; Cleveland; Detroit; St. Louis; Boston; Atlanta.

RETURN POSTAGE GUARANTEED

VOLUME 87 NUMBER 9

AMERICAN MACHINIST. Copyright 1943 by McGraw-Hill Publishing Co., Inc.

Published every other Thursday, price 35c a copy. Allow ten days for change of address. Address all communications about subscriptions to the Director of Circulation, American Machinist, 330 West 42nd Street, New York, N. Y. Subscription rates—United States, Mexico and Central and South American countries, $5.00 a year, $8.00 for two years, $10 for three years. Canada, $5.50 a year, $9 for two years, $11 for three years. All other countries $8.00 a year, $13.00 for two years, $16.00 for three years. Entered as second class matter, September 20, 1936, at Post Office, Albany, N. Y., under the act of March 3, 1879. Printed in U.S.A. Cable Address "McGrawhill, New York." Member of A.B.P. Member of A.B.C.

A McGRAW-HILL PUBLICATION

PRINTED IN U. S. A.

MAJOR ARTICLES

Tomorrow's Planes Today 75
Quality Control Will Reduce Costs ..... *J. Manuele* 78
Training for Women ..... *R. S. Schultz and T. Applegate* 82
Postwar Disposal of Excess Machine Tools 85
Metal-Cleaning ..... *Dr. R. W. Mitchell and M. T. Zinty* 86
War-Winning Suggestions 89
Progress on the Plains 92

ARMAMENT SECTION

Chrysler Builds the Bofors Gun 97

SHORT ARTICLES

Canada Creates Precision Instrument Industry 138
ABC of the "Mike" ..... *Lewis W. Spaulding* 85

IDEAS FROM PRACTICAL MEN

Collet Adaptor for Small End Mills ..... *S. P. Caldwell* 94
Employs Welding to Remove Broken Taps ..... *A. J. Lavallee* 94
Burrs Machined From Small Castings ..... *Victor S. Voight* 95
Index Jig Speeds Radial Drill Work ..... *Fred Pfeiffer* 95
Double-Thread Broach Burnishes Parts ..... *Howard Fancher* 96
Multiple Threads Cut With the Compound ..... *J. H. Codd* 96

NEWS OF THE INDUSTRY

Gaging Business 116b
Inside Detroit 116e
Wartime Washington . 116g
Spotting the Air News. 116i
Names in the News... 116k
Obituaries 116l

DEPARTMENTS

Reference Book Sheet. 113
Editorial 116a
Shop Equipment News. 117
New Materials 134
Trade Publications 135
Seen and Heard 137

AMERICAN MACHINIST *chips*

We Like to Know Where You Live . . . No doubt you've noticed, scattered in odd places throughout this journal, requests to keep us advised as to your change of address. This is but one tiny cog in the very intricate train of gears constantly whirring to keep our subscriber list up to date. If you move jobs or position, we want to know about it (preferably two or three weeks in advance) so we can keep *American Machinist* reaching you promptly, properly addressed. In other words, we keep at your heels to keep this magazine at your elbow.

Thinking it might be of some interest to you, we pass on the following figures extracted from the 1942 Operating Statistics of the List Section of our Circulation Department. Of course, these cover the whole McGraw-Hill network of industrial communications (22 publications currently) and not just *American Machinist*. But they give you some idea of the way we try to keep up-to-date. Figures are for an average business day:

New Subscription Order entered every 36 seconds.

Renewal Order entered every 60 seconds.

A subscriber changes his address (and usually his job also) every 73 seconds.

A subscriber changes his job without changing his address every 30 minutes.

An entry of some sort is made on the McGraw-Hill subscription lists every 14 seconds.

You can help us a lot, and help yourself, by notifying us quickly of any potential change in position or address. To the right is a coupon similar to those which appear in most issues of *American Machinist*. Might be handy for you to use now.

✪

Request From Russia . . . *After a journey of two months and 11 days, and bandaged by both Russian and American (or British) censor stickers, a straggled letter from the U.S.S.R. It innocently asked for a copy of* American Machinist's *1940 Inventory of Metal-Working Equipment. What fascinated us was the sender's address: L. M. Tsyrlin, Furmanny pereulok dom No. 9, kv. No. 9, Moscow. You folks who live on just plain Elm or Pine St. don't know how lucky you are.*

✪

Using "The Tools of Our Trade" . . . Probably one of your biggest problems lies in teaching new personnel how to swing into production, fast. It would seem so, judging from the requests pouring in for the first of the new *American Machinist* special sections on fundamentals of metal working. The original 3,000 reprints went with a whoosh, the next 10,000 were spoken for before they were printed and the next 5,000 are leaving us in a hurry.

This all uses up paper, but we don't see how it could be used to better advantage right now. The longer the war lasts, and the more men drafted, the more pressing will be the need for such aids in training green hands.

You probably read No. 2 in the series, "How to Run a Drilling Machine" (April 15 issue). The note on its cover gives the purpose:

". . . training aids for war-crowded metal working shops. Designed to take the worker fresh from the streets and get him or her into production with the barest minimum of training, this section will tell him no more than what a drill press is, how it operates, what it can do."

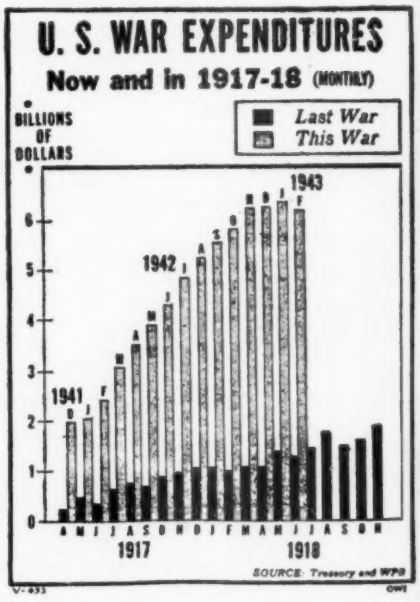
As long as you want these sections, and as long as Uncle Sam & Co. let us have the paper to print them, we will continue to send out reprints. Price, 10¢ each, less in lots of over 500.

✪

Now It's 10% PLUS . . . *We're sure every American is aware of the recent opening of the Second War Loan Drive. However, we'd like to add our voice to the many reminding you that it is going to take extra sacrifice on the part of all of us to reach the immediate goal of $13,000,000,000. Let's dig down deep.*

✪

And That Ain't Hay! . . . The cost of World War I was just pin money, according to the chart below from a recent OWI *Victory Bulletin*. We further learned that the *daily* average government expenditure for the war during February was $253,400,000. Yep, every 24 hours. Even though we're blasé to billions these days, this certainly looks like a lot of dough.



MOVING?

If you plan to change the address to which your copies of *American Machinist* are sent, let us know now. We don't—and we're sure *you* don't—want a single issue to be delayed in reaching you. Coupon below for your convenience.

AMERICAN MACHINIST • 330 W. 42nd St., New York

MY OLD ADDRESS	MY NEW ADDRESS
Name	*Name* .....
Title	*Title* .....
Company	*Company* .....
Address	*Address* .....

MARINE REDUCTION UNIT

750 H.P.
from
850 R. P. M.
to
500 R. P. M.

Marine drive manufacturers, faced with the problem of making better reduction units than ever before, have found that bevel gear planetary units meet and surpass their production and performance requirements.

Examine the advantages these units offer:

1. Compact, light, straight-line design
   Unit shown is only 18" diameter.
2. High load capacity
   Multiple pinions share load equally.
3. Fast, accurate manufacture
   Bevel gears cut by efficient generating method in standard Gleason machines.
4. Assembly control
   Bevel gears adjusted in assembly for control of backlash.
5. Range of Application
   Reductions from approximately 1.5/1 to 2.5 1. Similiar units also used as reverse drives.

Extend these advantages to your drive applications. The Gleason Works, with over 75 years' experience in the bevel gear industry, stands ready to help you. Our engineers will be pleased to aid in designing your planetary gears and in specifying the correct Gleason machines for their manufacture.

GLEASON

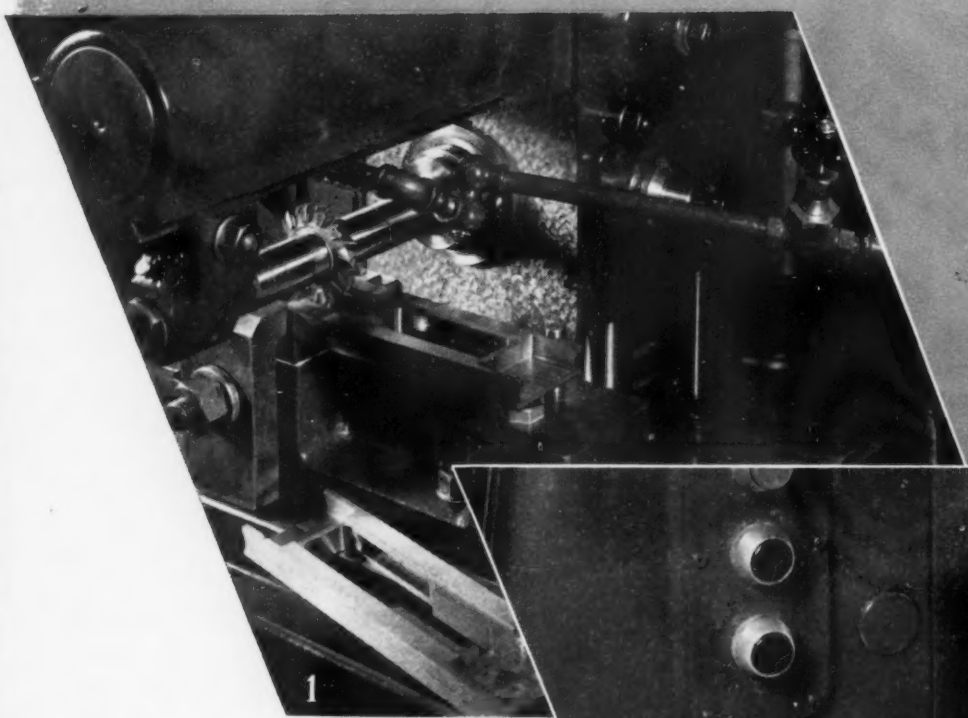
GLEASON WORKS

Builders of Bevel Gear Machinery for Over Seventy-five Years

1000 UNIVERSITY AVENUE ROCHESTER N Y U S A

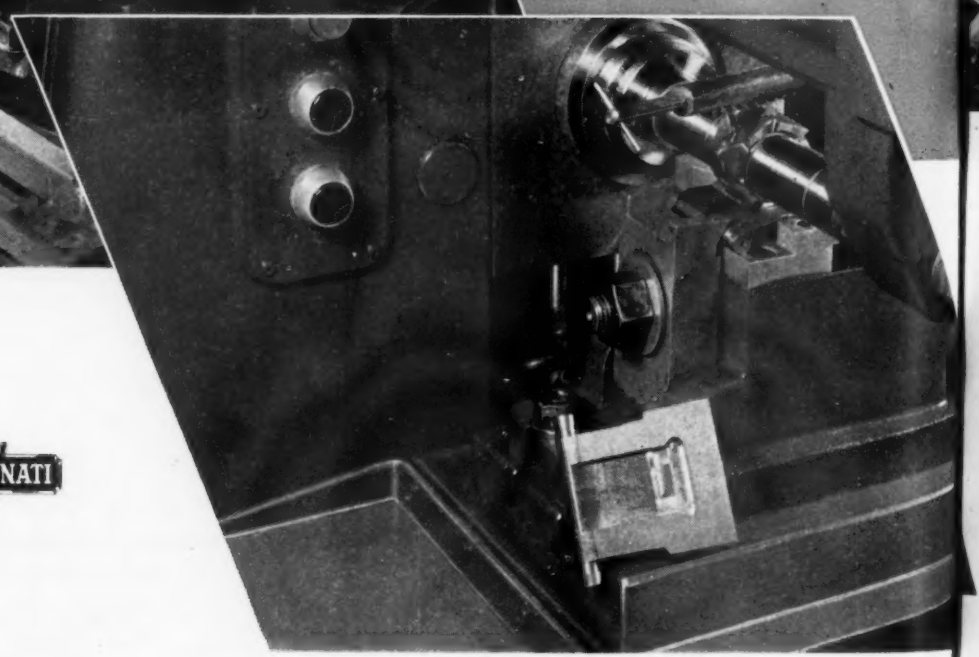
ARMY E NAVY

. . . INSTALL CINCINNATI 0-8s and watch your production climb



1 *Milling notch and inside opening—rear lower plate of gun part—on CINCINNATI 0-8 Plain Automatic Milling Machine with automatic Rise and Fall Spindle Carrier.*

2 *Milling gun locking device. Another example of the usefulness of CINCINNATI 0-8 Plain Automatic Millers when equipped with automatic Rise and Fall Spindle Carrier.*



CINCINNATI

★ ★ ★ ★ ★ ★ ★ ★ ★ ★

ARMY (E) NAVY

Navy E awarded March 6, 1942. Renewal star awarded August 29, 1942, along with Army-Navy E. The second star was awarded Feb. 23, 1943.

★ ★ ★ ★ ★ ★ ★ ★ ★ ☆

THE CINCINNATI

MILLING MACHINES

Here a CINCINNATI 0-8 Plain Automatic Milling Machine equipped with automatic Rise and Fall Spindle Carrier is profile milling top face and burring the inside edge of the oval web opening of Rotating Hook.

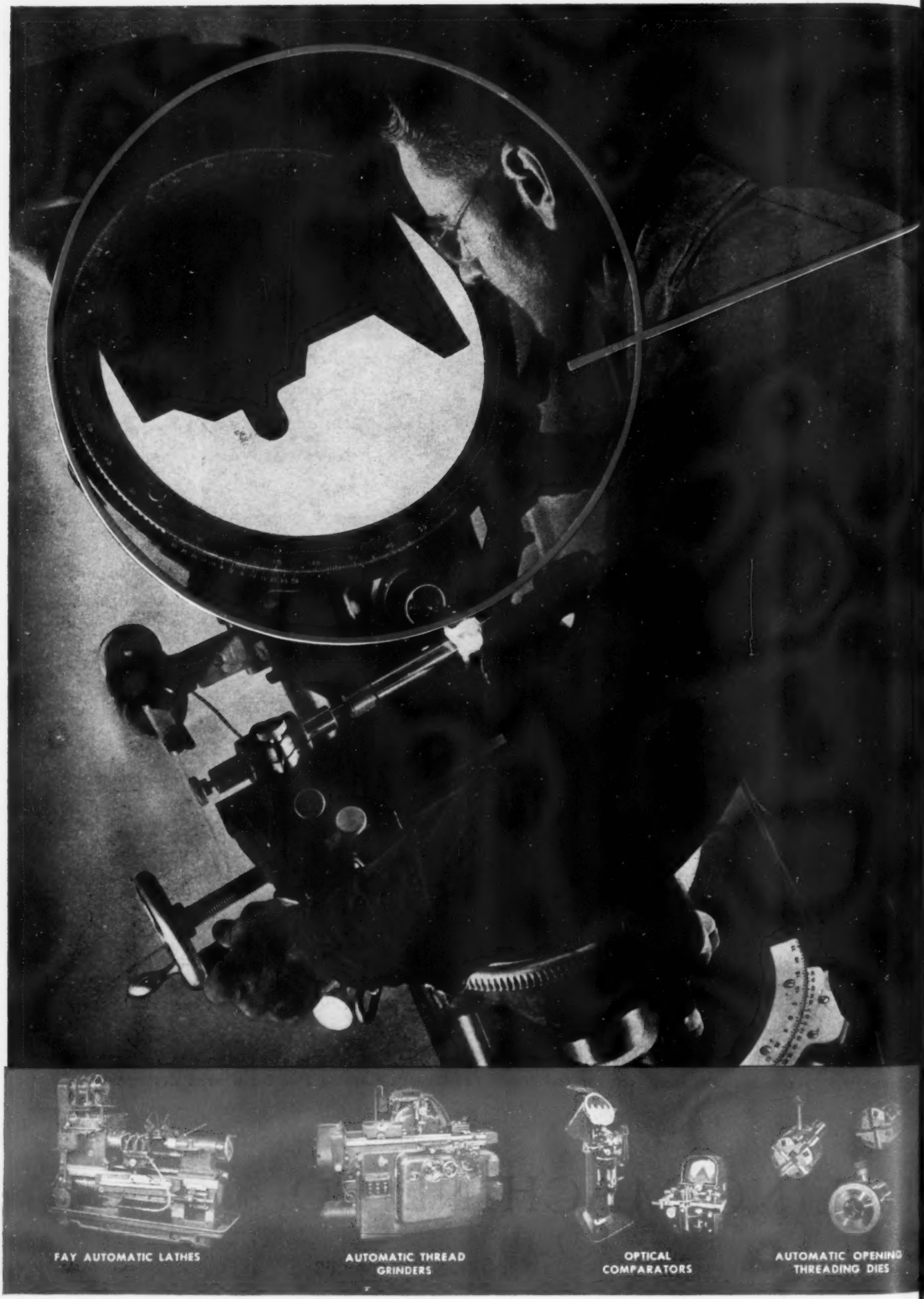
These illustrations give some idea of the usefulness of CINCINNATI 0-8 Plain Automatic Milling Machines equipped with automatic Rise and Fall Spindle Carrier. Unusual production records are everyday occurrences with those who use these versatile machines for milling small parts. The ability to do fast, accurate work is inherent in the 0-8 Miller, and when equipped with the automatic Rise and Fall Spindle Carrier, its usefulness is increased many times over.

Unless you are familiar with the possibilities of the 0-8, you are overlooking one of the best machines on the market for fast, accurate, economical, and almost continuous production of small parts. If your output lags, or if your small parts work calls for a machine that will handle a wide range of milling operations, install a CINCINNATI 0-8 Miller, and watch production climb. The 0-8 was developed by the engineers here at Milling Headquarters, and is an outstanding contribution to the science of metal cutting.

Write for specification catalog M-964-1 which covers all details and their benefits. Or look in Sweet's Catalog File for a brief description.

MILLING MACHINE CO. CINCINNATI, OHIO, U. S. A.

BROACHING MACHINES • GRINDING MACHINES • LAPPING MACHINES



FAY AUTOMATIC LATHES

AUTOMATIC THREAD GRINDERS

OPTICAL COMPARATORS

AUTOMATIC OPENING THREADING DIES

Better

TOOLS AND GAGES

through inspection by optical projection with Jones & Lamson COMPARATORS

The inspection and measurement of tools, gages, production parts and products by optical projection with **Jones & Lamson Optical Comparators** has been the solution of many an inspection problem, and has resulted in better tools and gages and substantial savings in costs.

There is a **Jones & Lamson Comparator** for every need in the field of inspection by optical projection. These machines are *designed with a thorough understanding of shop practice, to meet shop requirements,* and built with all the care, accuracy and precision that so long have been the tradition of this company.

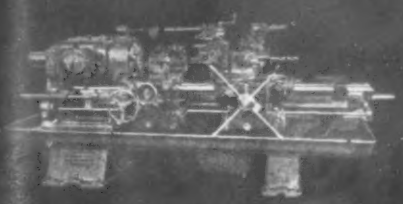
Jones & Lamson Inspection Engineers are ready to study your inspection problems and make recommendations based upon over twenty years of experience in the development of **Comparators** for inspection by optical projection.

JONES & LAMSON

MACHINE COMPANY

Springfield, Vermont, **U. S. A.**

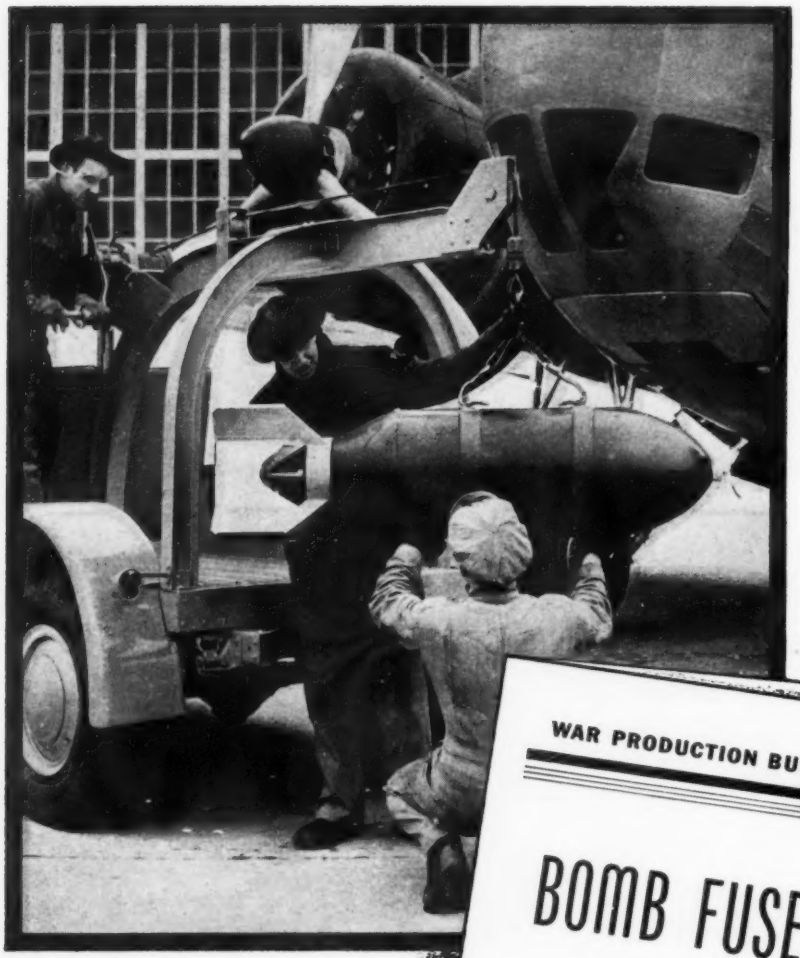
Manufacturers of: Universal Turret Lathes · Fay Automatic Lathes · Automatic Thread Grinders · Optical Comparators · Automatic Opening Threading Dies.



SADDLE TYPE
UNIVERSAL TURRET LATHES

PROFIT-PRODUCING
MACHINE TOOLS

RAM TYPE
UNIVERSAL TURRET LATHES



DESTRUCTIVPRE

. . . BU Us

WAR PRODUCTION BULLETIN

BOMB FUSE GEARS

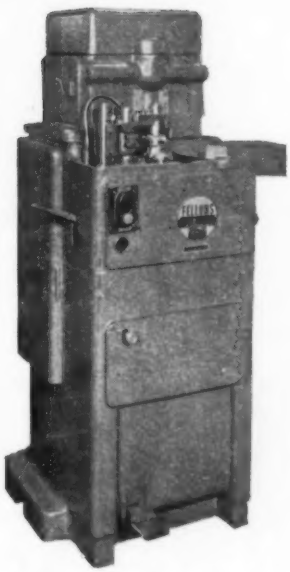
are speeding from Fellows Fine-pitch Shapers to plants from coast to coast . . . precision made to function flawlessly in blasting the Axis anywhere and everywhere

FELLOWS

MACHINES AND TOOLS FOR GEAR PRODUCTIO

PRECISION Now

Useful PRECISION LATER ON

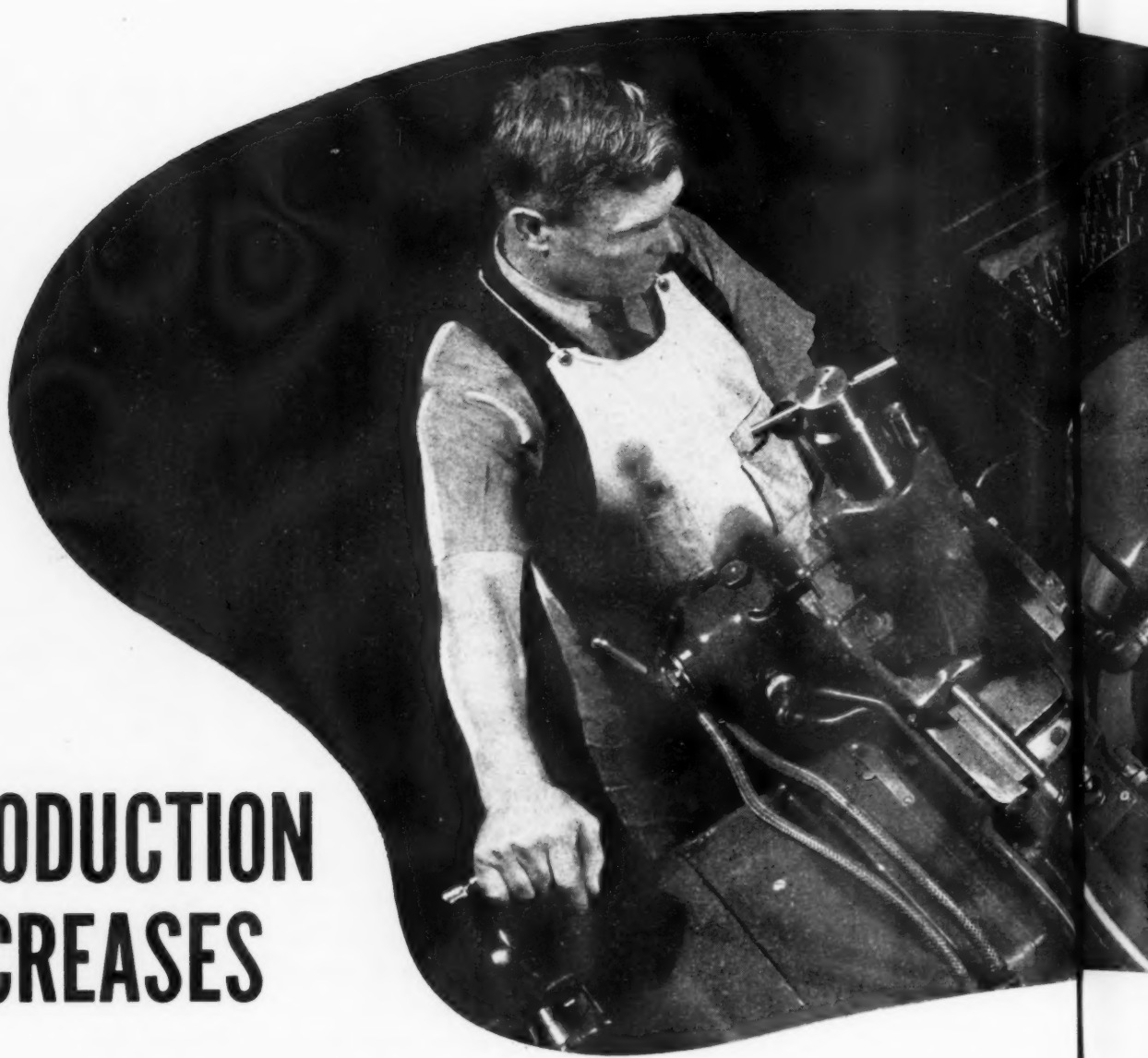


Fine-pitch Gear Shaper

Destruction in handy 100 lb. units, and in 1,000 lb. and 2,000 lb. packages, in bombs for delivery to the enemy, fuse-end first. Bombs in whose fuse mechanism a tiny gear train must function with split-second accuracy. Statistics are forbidden, but imagination readily paints a picture of the quantities required for the output of our bomb arsenals . . . To their production, the phenomenal capacity of the Fellows Fine-Pitch Gear Shaper, and Straight Line Gear Generator are making a notable contribution. 1500 and 2000 cutter strokes per minute, permit the cutting of gears in thousands, where hundreds were once a measure of speedy production . . . For after-the-war use, every manufacturer of fine-pitch gears should be informed on this latest—small gear manufacturing equipment. Write: The Fellows Gear Shaper Company, Springfield, Vermont—or 616 Fisher Bldg., Detroit, Michigan, or 640 West Town Office Bldg., Chicago, Illinois.

Method

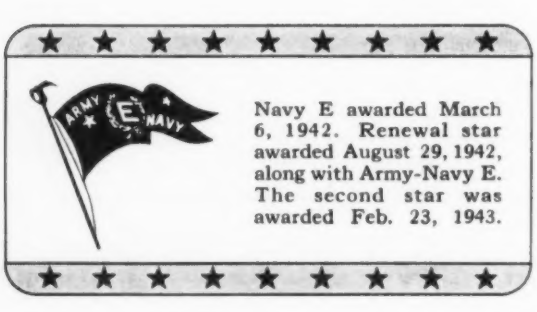
. . . . FROM BLANK TO FINISHED GEAR



PRODUCTION INCREASES

when Cincinnati Engineers tackle a grinding rol

Deve
quart
cente
You
for a
Grin



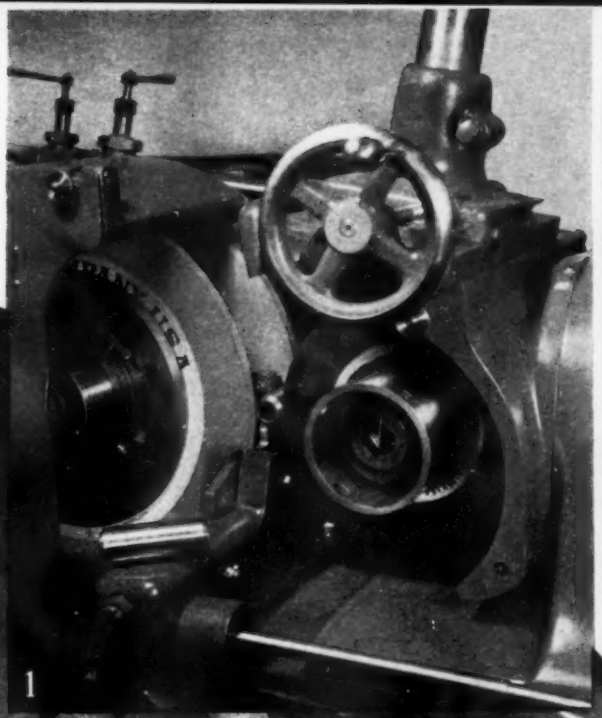
Navy E awarded March 6, 1942. Renewal star awarded August 29, 1942, along with Army-Navy E. The second star was awarded Feb. 23, 1943.

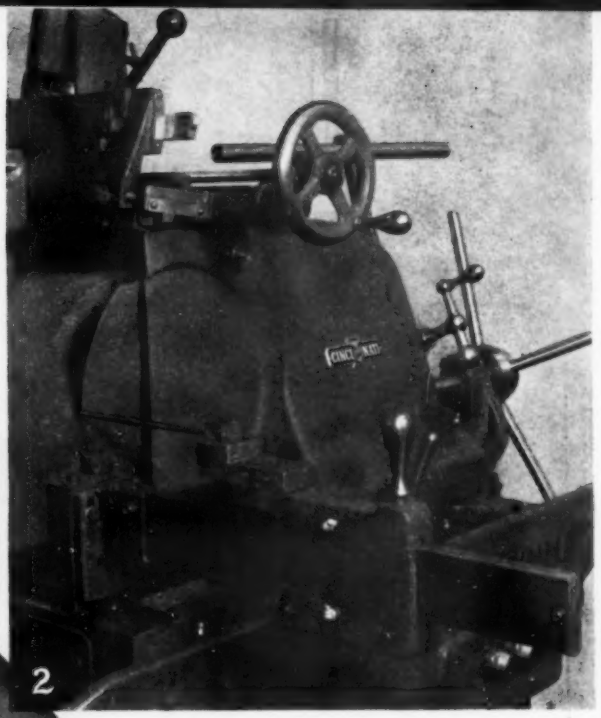
CINCINNATI G

CIN

CENTER TYPE GRINDING MACHINES

CENT





No. 1. Grinding bevel on each end of piston pin for aviation engine. An infeed grinding job. Both bevels ground at one time. Machine is arranged for profile truing bevels on each of the two one-inch wheels.

No. 2. Rough grinding taper on two ends of spinning spindle. Notice special workrest with hand operated pusher type loading attachment and special positive end stop. In both illustrations a CINCINNATI No. 2 Centerless Grinding Machine is used.

CINCINNATI

ngroblem

CINCINNATI Centerless Machines have reduced many grinding operations from hours to minutes—sometimes to seconds. And jobs that once required hours of painstaking care and exceptional skill are now handled by CINCINNATI Centerless Grinders in far less time and with greater accuracy.

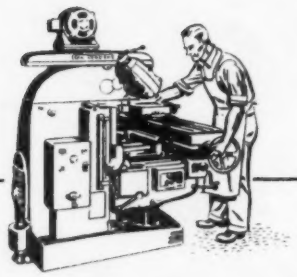
Development of the Centerless Machine is due largely to the ingenuity and resourcefulness of the engineers here at Grinding Headquarters. This group of experts will be glad to recommend a solution to any problem you may have which involves either centerless or centertype grinding. You are invited to use the services of this staff of grinding authorities at any time.

You will be interested in the production possibilities of the CINCINNATI Centerless, and we suggest you look in Sweet's Catalog File for a brief description of these unusually productive grinders. Also described are CINCINNATI Plain Hydraulic and Hydraulic Universal Grinding Machines. Let us know in which you are interested, and we shall send specification catalog giving complete details.

TI GRINDERS INCORPORATED

CINCINNATI, OHIO, U. S. A

IES CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

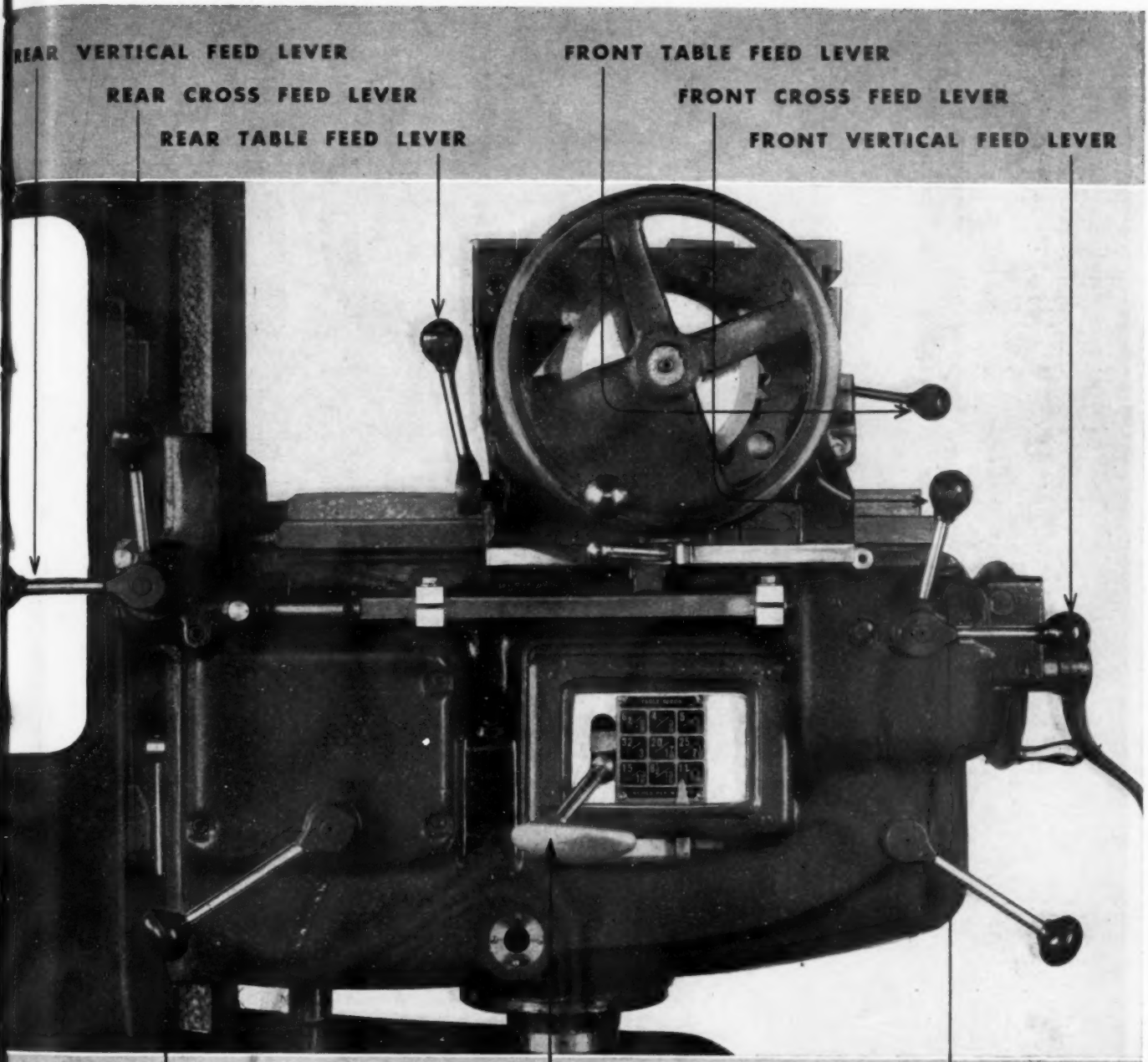


VAN NORMAN CONTROLS ARE *Easy to Reach and Use*

...SAVE TIME AND LESSEN FATIGUE

An operator working at the front or back of a Van Norman Milling Machine can readily reach a full set of power controls without going around to the other side of the machine. These controls are conveniently grouped and easy to use. They are *directional* in motion and remove any chance of confusion, because the levers are moved in the same direction in which the operator wishes to move the table, knee and saddle,—left or right, up or down. An illustrated bulletin describes these and many other advantages of Van Norman Milling Machines. Write for a copy today, on your business letterhead.

VAN NORMAN MACHINE TOOL COMPANY


REAR VERTICAL FEED LEVER
REAR CROSS FEED LEVER
REAR TABLE FEED LEVER
FRONT TABLE FEED LEVER
FRONT CROSS FEED LEVER
FRONT VERTICAL FEED LEVER
REAR RAPID TRAVERSE LEVER
SINGLE LEVER FEED SELECTOR
POWER RAPID TRAVERSE (ALL DIRECTIONS)

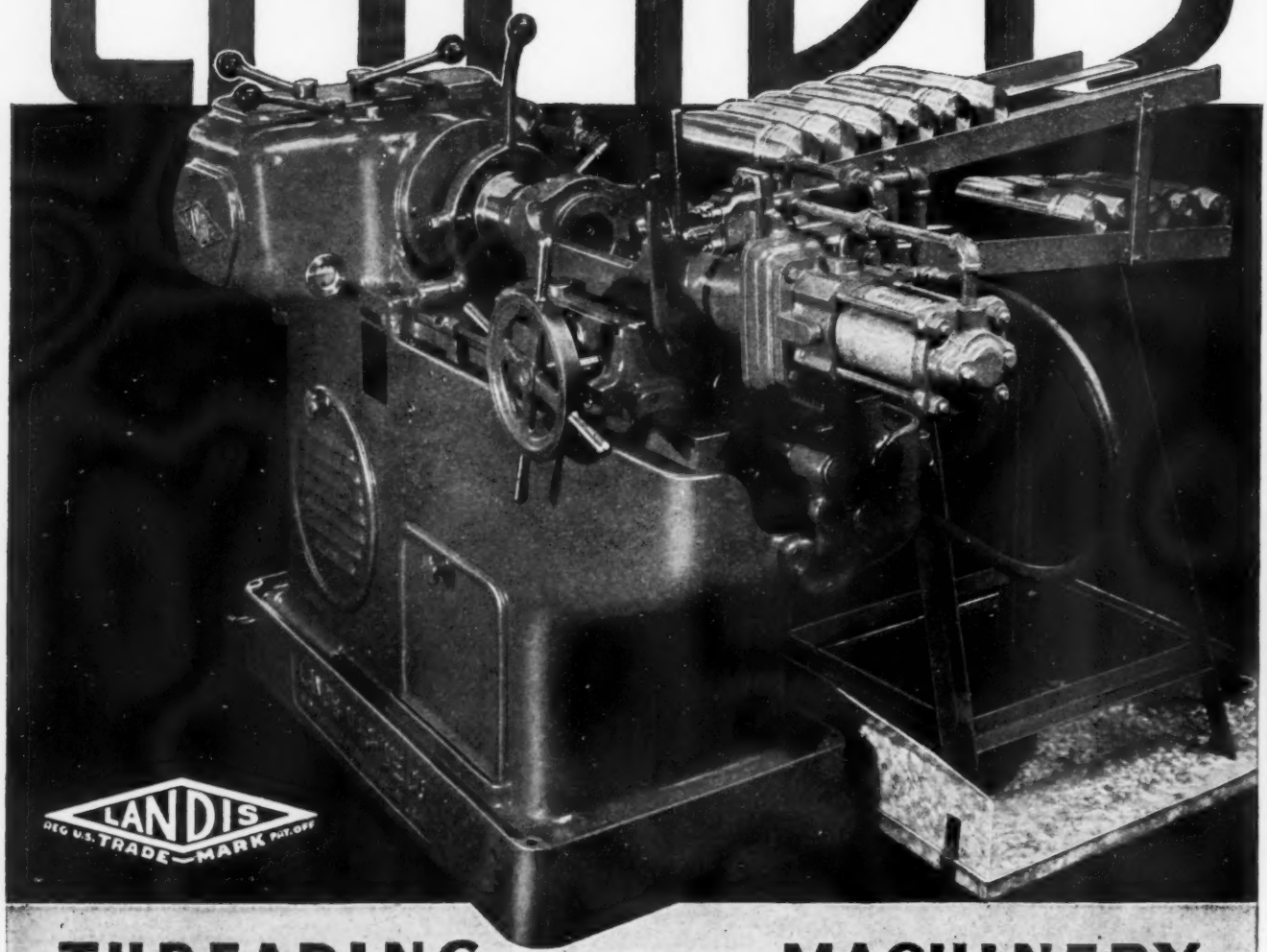
Van Norman

MILLING MACHINES

In June, 1942, Van Norman was awarded the Army and Navy E in recognition of its war production record

SPRINGFIELD, MASS.

LANDIS



THREADING MACHINERY

THREAD CUTTING DIE HEADS

COLLAPSIBLE TAPS

Greater Accuracy
Higher Production
at Lower Cost....
Write for Catalog

LANDIS MACHINE COMPANY

THREADING MACHINERY—THREAD CUTTING DIE HEADS—COLLAPSIBLE TAPS

"Photo By U. S. Army Signal Corps"→

LANDIS Hardened and Ground Die Heads possess many superior and exclusive features. All parts are hardened to insure maximum wearing qualities and are precision ground to guarantee accuracy.

The few operating parts of LANDIS Die Heads and their precise assembly make it possible to produce threads within extremely close tolerances on a high production basis.

Write for Bulletin F-80-3

WAYNESBORO, PENNSYLVANIA, U.S.A.

THREADING MACHINERY—THREAD CUTTING DIE HEADS—COLLAPSIBLE TAPS

The AMERICAN PACEMAKER . .

. . offers 27 spindle speeds with only 2 control levers

Control convenience and easy operation are two of the many outstanding features offered in "AMERICAN" Pacemaker Lathes.

Any one of 27 spindle speeds is available through only 2 conveniently placed direct reading levers *without having to refer to index plates or having to remember lever positions.*

Operators are highly enthusiastic in their praise of this new "AMERICAN" speed control. They like it because their work is easier; they are able to produce more work with this simplified control. Pay roll dollars buy more production because of this modern "AMERICAN" development.

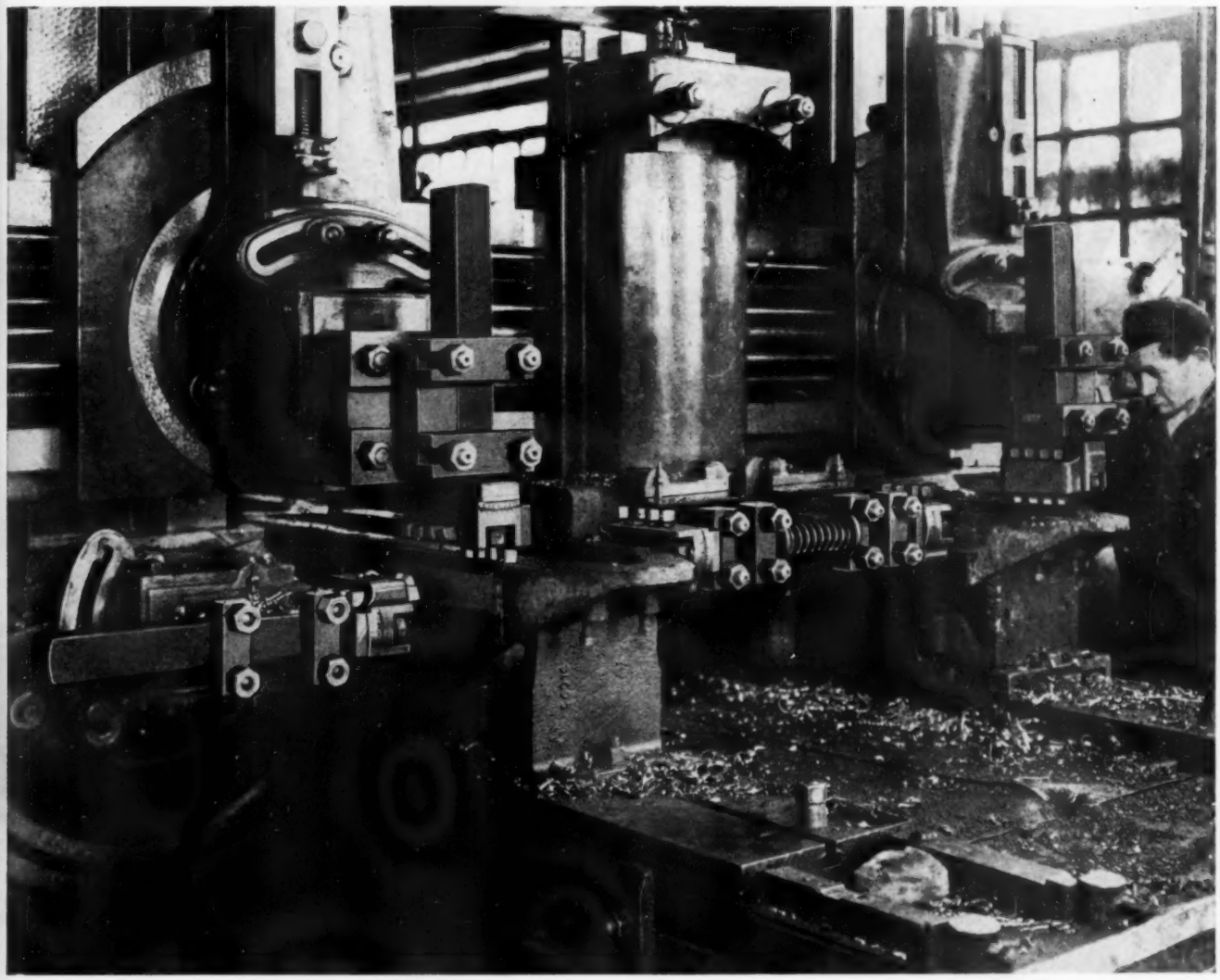
This feature and others equally valuable are fully described in the "AMERICAN" Pacemaker Bulletin No. 15. Send for your copy today.

The AMERICAN TOOL WORKS CO.

Cincinnati, Ohio, U.S.A.

LATHES • RADIALS

ARMSTRONG



The larger the work, the longer the run, the greater the saving of high speed steel with ARMSTRONG TOOL HOLDERS

With high speed steel so essential to maximum production and so restricted in supply, to use it in forged tools for any standard operation is to be wasteful of critical materials. There are ARMSTRONG TOOL HOLDERS *for every operation on lathes, planers, slotters and shapers*—tool holders that make each ounce of high speed steel do the work requiring 10 ounces in a bar tool; tool holders for the most delicate work and for the heaviest cuts on the very largest machine tools.

Each is an efficient tool that will stand up to continuous, full capacity operation indefinitely. Each takes cutter bits any mechanic can quickly grind from stock shapes of high speed steel —a tool that "Saves: All Forging, 70% Grinding and 90% High Speed Steel." Use ARMSTRONG TOOL HOLDERS wherever possible, especially on large work and long runs where the saving of high speed steel is the greatest.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

315 N. FRANCISCO AVE. CHICAGO, U.S.A.

Eastern Warehouse and Sales:

199 Lafayette St., New York

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

George Grindit Says

"There's a lot of sentiment connected with diamonds. To young people in love they serve as a pledge. And to the grinding machine operator in love with his job, they can also serve as a pledge that his life will be a more pleasant one."

IT'S ALL HERE

THE LANDIS 4" TYPE H PLAIN HYDRAULIC GRINDER

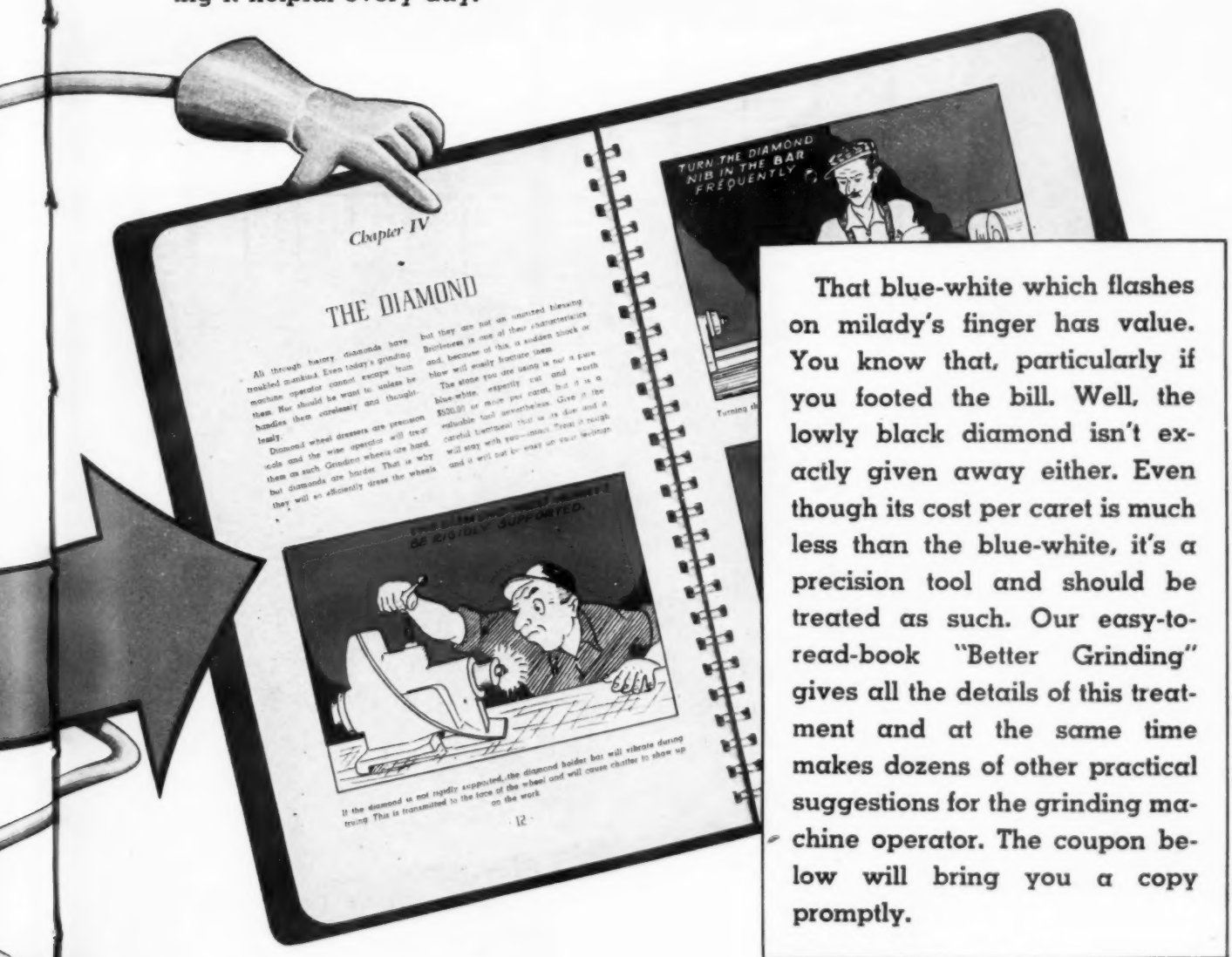
- Recommended for the production grinding of small, light parts not exceeding 1¼" or 1½" in diameter.
- Used by many war industries for the grinding of such work as small rifle parts, small bearings, valves and other small airplane parts.
- Available in two lengths, namely, 12" and 18".

IF YOU HAVE A GRINDING PROBLEM

Let George do it

LANDIS TOOL COMPANY

The book "BETTER GRINDING" procurable only from the Landis Tool Company, Waynesboro, Pennsylvania, pictures and describes the basic principles of all precision grinding. Thousands of both old and new operators, supervisors and apprentices are finding it helpful every day.


Chapter IV
THE DIAMOND
TURN THE DIAMOND NIB IN THE BAR FREQUENTLY
If the diamond is not rigidly supported, the diamond holder bar will vibrate during truing. This is transmitted to the face of the wheel and will cause chatter to show up on the work
12

That blue-white which flashes on milady's finger has value. You know that, particularly if you footed the bill. Well, the lowly black diamond isn't exactly given away either. Even though its cost per caret is much less than the blue-white, it's a precision tool and should be treated as such. Our easy-to-read-book "Better Grinding" gives all the details of this treatment and at the same time makes dozens of other practical suggestions for the grinding machine operator. The coupon below will bring you a copy promptly.

THE CHAPTERS

Work Centers and Centers in the Work . . Work Drivers and Driving Dogs . . Work Rests . . The Diamond . . Wheel Dressing and Wheel Truing . . Mounting and Balancing the Wheel . . Grinding Wheel Coolant . . Lubrication . . Multiple V Belt Drives . . Wheel Spindles and Bearings . . Grinding Wheel Feed . . Grinding Wheel Width . . Speed of Work Carriage Traversal . . Work Speed . . Grinding Wheel Speed . . The Grinding Wheel . . Chatter . . Miscellaneous Bits.

Please Send Me a Free Copy of . . .

"BETTER GRINDING"

NAME _____

ADDRESS _____

COMPANY _____

NO. 4 _____ CITY

Please Print Above and Send To

LANDIS TOOL CO.

WAYNESBORO, PENNSYLVANIA

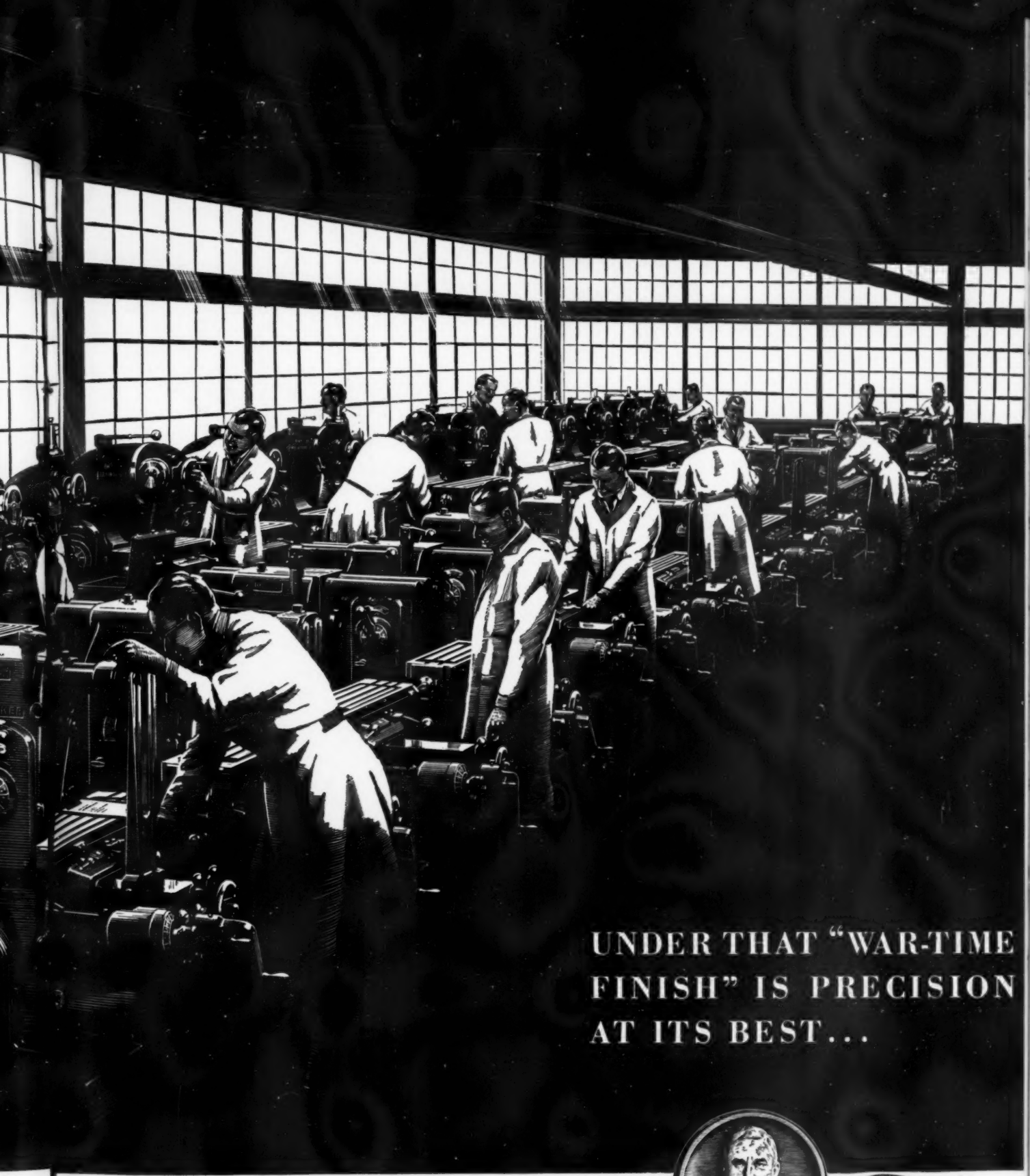
WAYNESBORO, PENNSYLVANIA

A section of an inspection floor in one of the Kearney & Trecker plants.

Gone are the gleaming surfaces that once were the proud exteriors of Milwaukee Milling Machines. War paint is the order of the day. Despite this outward change, the basic workmanship of exacting precision remains unchanged.

In the plants of Kearney & Trecker, large groups of highly trained technical men work with unhurried thoroughness despite the pressure of mass production. Machines are checked, tested and gauged at every step of construction and assembly.

Milwaukee MACHINE



UNDER THAT "WAR-TIME FINISH" IS PRECISION AT ITS BEST...

This precise inspection insures the performance of thousands of Milwaukee Milling Machines destined for important service in war plants everywhere.

KEARNEY & TRECKER CORPORATION
MILWAUKEE, WISCONSIN, U. S. A.

KEARNEY & TRECKER
CORPORATION

E T O O L S

GRINDERGRAMS

Reduce pressure on lubrication lines to table and wheel slide ways to minimum consistent with smooth operation. Excessive pressures and resultant oil volume may cause table of wheel slide to "float" with erratic grinding effects.

ONE GOAL

WE Americans have but one immediate, all-engrossing goal — VICTORY. To each of us falls some task to further that objective.

With Norton Company, our duty is clearly set forth. Norton pioneered the art of precision grinding—sought out and developed many of the advanced improvements in the grinding machine—has ever blazed the trail toward that miracle of modern production—Surface Finish with Dimensional Accuracy. And this is our responsibility. Dimensional accuracy through grinding makes possible the perfect fits, the interchangeability, the absolute precision of parts which go to make up our fighters' weapons on land, sea and in the air. In all phases of this modern armament production Norton grinding machines play allotted parts, a complete effort by which our Nation and its valiant Allies will win through—and soon—to that ultimate goal —VICTORY.

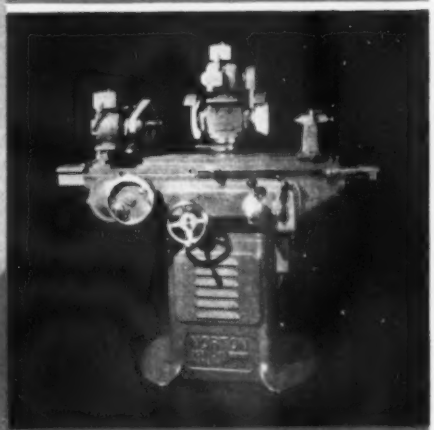
NORTON COMPANY, WORCESTER MASS.

New York • Chicago • Detroit • Cleveland • Hartford

M-456

CYLINDRICAL

SURFACE



TOOL and CUTTER

LAPPING

NORTON MACHINES

• GRINDING and LAPPING •

REMEMBER THE

PROBABLY the most disastrous example of obsolescence in history is the Maginot Line. It took 5 years to build, and cost $500,000,000. But—Hitler circumvented it in a few weeks with modern equipment and methods . . . panzer divisions, air forces and fifth columnists.

WE WONDER how many "Maginot Lines" there are in American industry, today. How much machinery, busy now on war production, will become obsolete with the coming of peace? Like Hitler's panzers and air forces, new materials and processes even now in development will drastically reduce the utility value of present machines. Newer and more productive equipment employed by aggressive and ingenious competition will dominate the peacetime markets.

SINCE POSTWAR PLANNING is now both respectable and popular, we believe it will benefit American industry, individually and collectively, to start studying the future usefulness of present equipment. We say *individually,* because of competition within our borders. We say *collectively,* because many of the machines shipped abroad are far ahead of much domestic machinery in newness, usefulness and durability. If we are to match wits and goods with foreign competition after the war, *and maintain our superior standards of living,* we must have more productive machines to overcome lower labor costs in foreign plants.

WORK AND PROSPERITY for all can come only from productive services. Money transferred from one pocket to another . . . such as a government bounty to the unemployed . . . creates nothing. We can look for "business as usual" after the war, only if we replace depreciated and obsolete methods and equipment with the most modern and productive tools which ingenuity can develop.

LET'S NOT HAVE A MAGINOT LINE IN AMERICAN INDUSTRY!

Maginot Line?

THE MONARCH MACHINE TOOL COMPANY • • • SIDNEY • OHIO

MONARCH LATHES

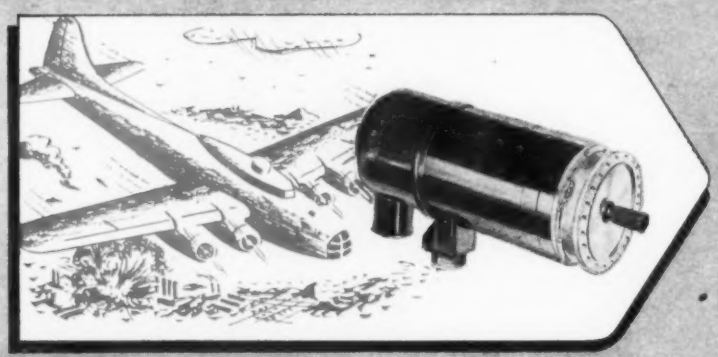
Cover the Turning Field

Do You Need

MOTORS FOR NAVAL APPLICATION

In a space of *five weeks*, production of a brand new series of motors was raised 400 motors per week. Scheduled delivery to eight different customers was smoothly established.

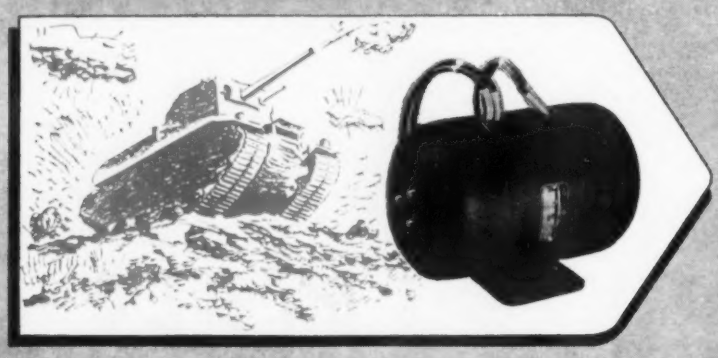
★



A SMALLER, LIGHTER GENERATOR FOR AIRCRAFT

A generator *one-sixth the weight* of comparable industrial types was developed, meeting stringent specifications for high-altitude performance —a typical example of ingenious G-E design.

★



A SPECIAL DYNAMOTOR FOR USE ON TANKS

To power radio equipment in tanks, a special dynamotor with increased capacity was developed. Sample in eight weeks; production in large quantities eight weeks after approval.

Builder of TRI-CLAD Motors ★ AMPLIDYNES AIRCRAFT POWER PACKAGES DYNAMOTORS GENERATORS EVERYTHING IN MOTORS

FIGHTING MOTORS*?

WE MAY BE ABLE TO HELP YOU

WE invite builders of motor-operated combat equipment to get in touch with us in the earliest stages of planning for their motor requirements. We are building so many new and ingenious fighting motors, it's 10 to 1 that we already have something which can be adapted to meet your needs.

Although we cannot accept any new orders for certain types of fighting motors, we do have, or will have in the very near future, facilities to engineer and build additional fighting motors of other types. We would appreciate the opportunity of reviewing your needs during the earliest stages of your planning, in order to determine how we can help you.

We have the pledge of the more than 1700 design and application engineers in our motor plants to give the fastest service it is humanly possible to give whenever they are asked to help on fighting motors. And even if we must say "No," we believe you will appreciate a fast answer. Get in touch with your local G-E representative to see if the fighting-motor design you need can be adapted to our available production facilities. *General Electric Co., Schenectady, N. Y.*

*"FIGHTING MOTORS" is our term for electric motors in equipment used by our fighting forces — motors which contribute to combat efficiency. In contrast to motors used for production, they may be designed, and produced by the thousands, and declared obsolete — all within a few months.

Fighting motors often require amazing ingenuity in their design, always demand the utmost in reliability, and must be produced with a new concept of speed. They are truly *life or death motors.*

GENERAL ELECTRIC

Scherr Micrometer Parallels, 2 per set, about .0125 variation in thickness. Price $25.00

Optical Flat used to compare various combinations of gage blocks for size and wear.

TEST YOUR GAGES AND LAPPED PARTS

for **PARALLELISM** and **FLATNESS** with **SCHERR OPTICAL FLATS** . . . . . .

With the use of Scherr Optical Flats an accuracy in planeness within .000004 can be quickly and easily checked.

In checking the condition of a gage block for planeness, the Optical Flat is slid upon the lapped surface. The character of the interference bands that appear will disclose whether the surface is plane or whether uneven wear has occurred.

Operating on the principle of light wave interference, the thin air space between the flat and the lapped surface permits light waves to occur in successive, perfectly even layers of a number of different colors. The height of each layer of color is approximately .000015. The way in which these color layers appear indicates the amount of deviation from a perfectly flat surface.

Scherr Optical Flats assure the closest possible scientific means of checking parallelism and planeness of micrometer anvils, as well as gage block and lapped surfaces of parts for planeness. In adition to the 2 piece set of Micrometer Parallels illustrated, Scherr is prepared to make special sizes up to 5" diameter.

Complete detailed information is available promptly on request

Optical Flat placed on gage block.

Irregular pattern of interference bands produced by unevenly worn surface.

Straight or nearly straight lines, indicated a perfectly plane surface.

SCHERR COMPARITOL for checking gage blocks, gages and work for size, accuracy and wear.

OTHER INSTRUMENTS IN THE SCHERR LIMITED BUDGET INSPECTION LABORATORY

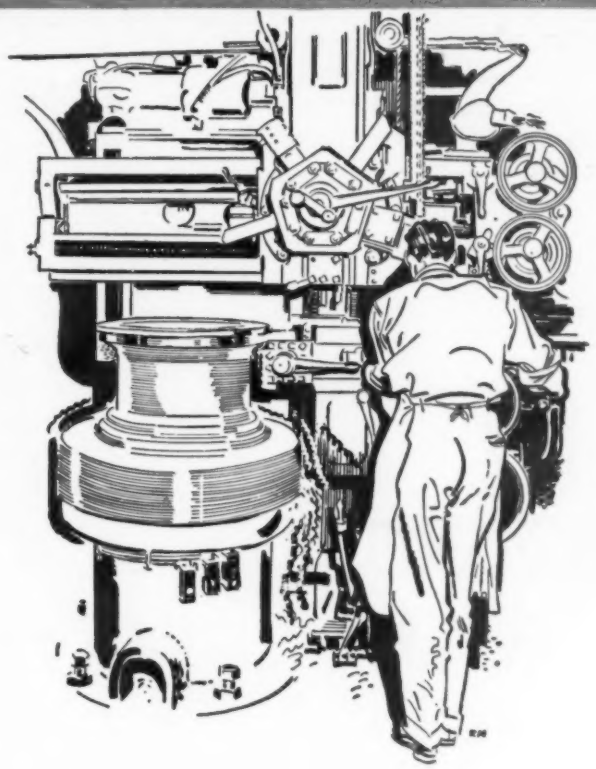
SPENCER BINOCULAR MICROSCOPE with 3-dimensional vision, reveals surface finish, imperfections, etc.

WILDER PROJECTOR for accurate measuring or comparing objects by means of a magnified shadow image.

GEORGE SCHERR COMPANY, INC. 124 LAFAYETTE ST., NEW YORK, N.Y.

OF COURSE YOU'LL BE USING MAGNESIUM

Consider, too, its fast Machining



You've been hearing how American Magnesium castings, forgings, shapes and sheet are contributing to the war effort. Their high strength-weight ratio is helping make planes stronger and faster. But there's another contribution that mustn't be overlooked; their easy, fast machining which is speeding plane production.

Magnesium is worked at the maximum speeds and feeds at which the machines will run. Cuts are deep but finishes are fine. Thus, production goes fast and quality is high.

How to take full advantage of this property of magnesium has been an object of extended research by American Magnesium Corporation. What we have learned in more than twenty years of working with this lightest of lightweight metals—tool shapes, lubricants, feeds and speeds—is available to every company desirous of boosting their war production.

Years of manufacturing magnesium products, and assisting in their design and fabrication, are responsible for the high quality of Mazlo Magnesium products. Sales Agent: Aluminum Company of America, 1709 Gulf Bldg., Pittsburgh, Pa.

MAGNESIUM MAZLO PRODUCTS

AMERICAN MAGNESIUM CORPORATION

SUBSIDIARY OF ALUMINUM COMPANY OF AMERICA

Twist Drills — Milling Cutters — Reamers — Hobs — Slitting Saws—End Mills— Taps—Dies—Screw Plates Profile Cutters—

THE TOOLS YOU BUY AGAIN

Try them on the basis of ASSURED *better performance . . .*

Shop after shop has come to recognize the ruggedness, accuracy and fast cutting action of UNION TOOLS after proving them out on difficult jobs.

There is sound reason for the better performance of these cost cutting tools. One of these reasons is the *experience behind them*—an experience that involves years of research, as well as outstanding technical, metallurgical and manufacturing facilities second to none in the field of small tool production.

Because Union has the means for producing tools of the finest quality and concentrates every resource on achieving highest performance standards on all tools bearing the name "UNION", users of UNION tools can always be certain of efficient, economical service.

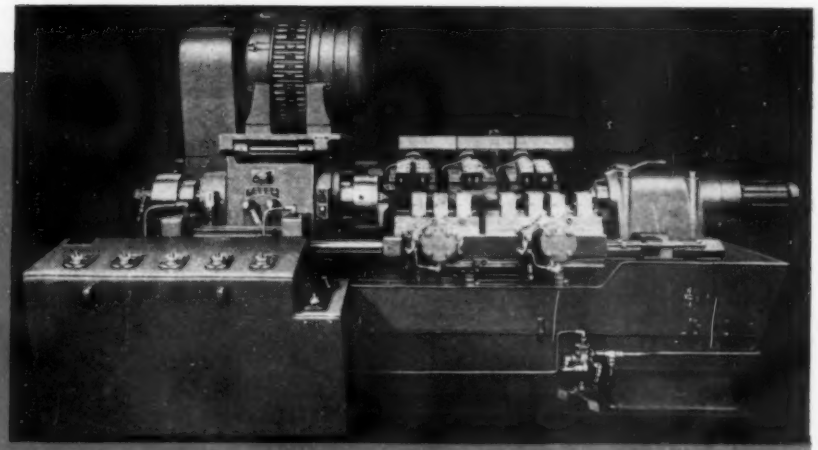
UNION TWIST DRILL CO.
Athol, Mass.

STORES New York Store: 61 Reade St.; Los Angeles Store: 524 East Fourth St.; Chicago Store: 11 So. Clinton St.; Seattle Store: 568 First Ave., So.; San Francisco Store: 121 Second St.; Detroit Store: 6540 Antoine St.

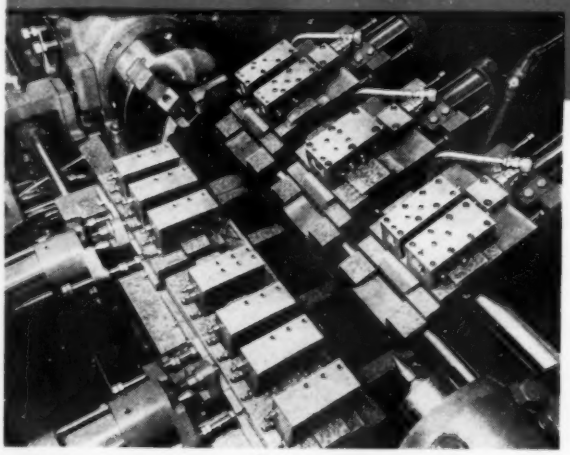
MANUFACTURING DIVISIONS
S. W. Card Mfg. Co., Div.; Mansfield, Mass.
Butterfield Division, Derby Line, Vt., and Rock Island, Quebec
Representatives throughout the world

UNION

SPECIAL TOOLING
Combined with
HYDRAULIC CONTROL
assure speed and accuracy in finish turning tank shafts on the



SPARKS *Semi-Automatic Hydra-feed* PRODUCTION LATHE



THE JOB and TOOLING

The Sparks lathe shown here is specially tooled for finish turning tank sprocket shafts. Ease of operation, accuracy and speed are attained through hydraulic control and tool set-up. The shaft being machined is 44" long with an average diameter of 5½". Carriage is 42" wide and work is held in a compensating chuck and live tailstock center. Individually controlled back slides and front cross slides are used, three back and two front.

Tooling is as follows: 8 front tools perform turning operations on 6 diameters; 7 back tools handle 4 facing operations (one of which both faces and cuts a diameter), 2 handle grooving and 1 chamfering.

This job typifies the class of work the Sparks Lathe is capable of handling on a high production basis. Outline your problem and ask Sparks engineers for suggestions on how to handle it quickly and accurately.

SPARKS FEATURES . . .

assure mass production

With hydraulic power applied to automatic control of sequential movements of tools, work, holding equipment and spindle starting and stopping, the Sparks lathe with its multi-tool set-up possibilities is a machine which can be depended on for handling a wide range of work on a mass production basis. Sturdiness is maintained because of heavy construction. Floor-to-floor time is reduced through automatic increase in the speed of tool movements during the non-cutting part of the cycle.

These features of the Sparks not only make possible a special purpose machine for a specific job but also make it adaptable to change over for other work upon redesign of the tooling set-up.

SPARKS HYDRA-FEED LATHE

SPARKS MACHINE TOOL CORPORATION
NORWALK . . . . CONN.

Are You Having Trouble Getting

SMALL

THREAD PLUG GAGES...!

We have them!

Immediate Delivery from STOCK

SIZES

0-80

to 1"-8

National Fine

National Coarse

AND

Pipe Plug Gages

$\frac{1}{8}$ **to** $1\frac{1}{4}$

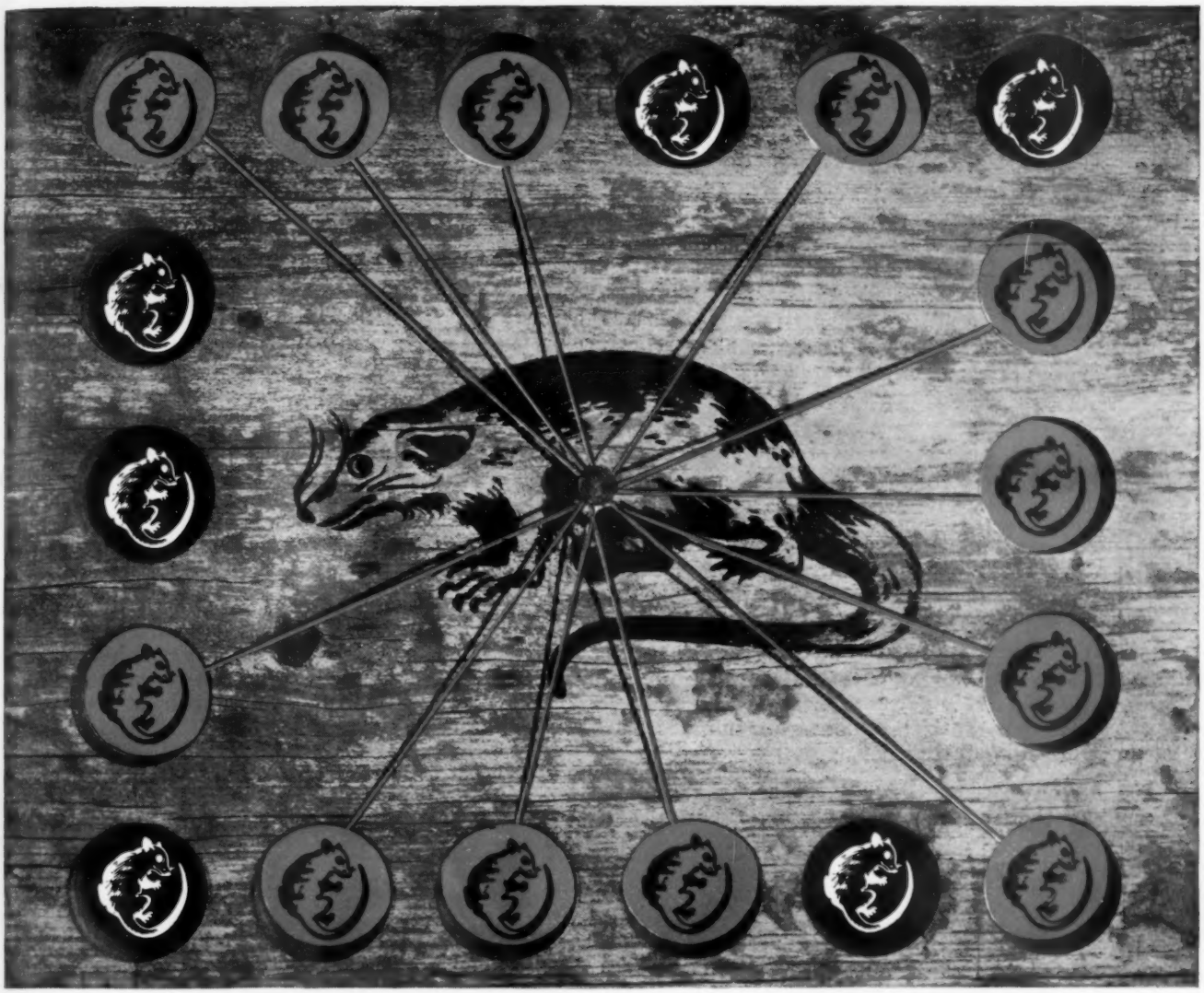
BY specializing in the manufacture of thread plug and ring gages, to the exclusion of all other types, the Cadillac Gage Company has built up an exceptional large stock of standard plug thread gages, especially in the machine screw sizes. Orders and re-orders from the nation's leading armament manufacturers testify to the quality and accuracy of our products. Wire us your orders!

CADILLAC GAGE COMPANY

20316 HOOVER RD. **DETROIT, MICH.**

CADILLAC GAGE COMPANY

DETROIT



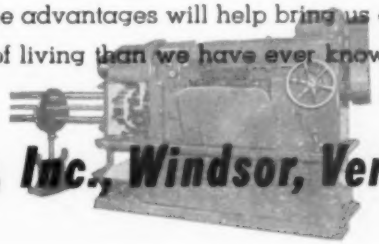
Nature's most tragic mistake

THE POSSUM'S LITTER consists of 18 babies. But mother possum can only accommodate 12. At birth, there's a mad scramble for the 12 nipples, and the first arrivals don't budge **for 6 weeks!** The other 6 babies just look on... and die of starvation.

What an ironic circumstance! A mother forced by fate to watch her own babies starve! And what a pointed illustration of the ruthlessness of Nature. In Nature and in business, the fight for survival is equally vital. Failure to keep abreast of changing conditions has invariably doomed the less alert industrials to business death.

Because they affect almost everything we touch, machine tools will be more necessary than ever in the post-war era. Machine tools are essential today to the output of the food you eat, the clothes you wear, your automobile, your vacuum cleaner, your washing machine, your refrigerator. Machine tools not only create new industries, but they create employment. They are largely responsible for our present way of life... unequalled by any other country in the world.

In our post-war era, Cone Automatic Multiple Spindle Lathes will be even more essential than they are now. Their unique advantages will help bring us all higher standards of living than we have ever known before.



CONE Automatic Machine Company, Inc., Windsor, Vermont

NEW HEAVY TOOLS GIVE MORE RIGIDITY AND GREATER RANGE TO

CINCINNATI **ACME** TURRET LATHES

● Acme Machine Tool Co. have developed a NEW LINE of MASSIVE TOOL HEADS AND HOLDERS. These meet today's demands for power—high speed and accuracy imposed by carbide tool steels.

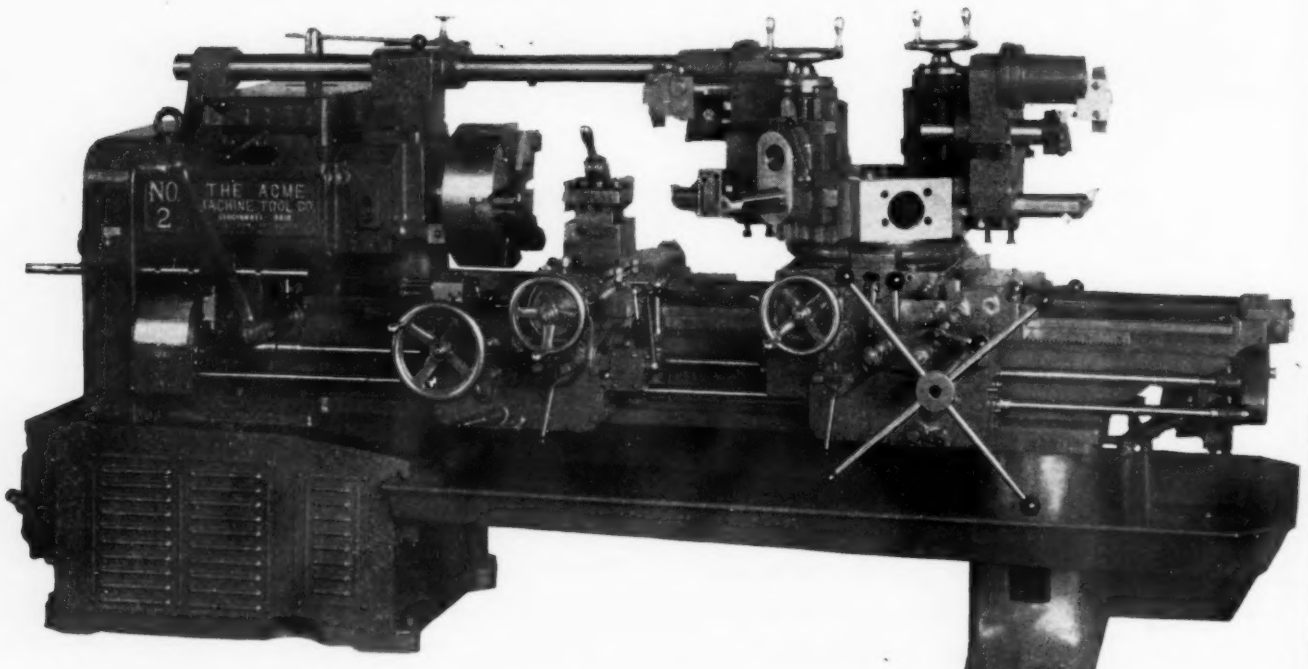
The head at the left is the adjustable multiple turning head with guide bushing which takes its support on a rigid heavy stationary bar mounted on headstock.

At the extreme right is shown the standard heavy duty multiple turning head without the adjustable feature, but with fixed center holes for holding the cutter heads.

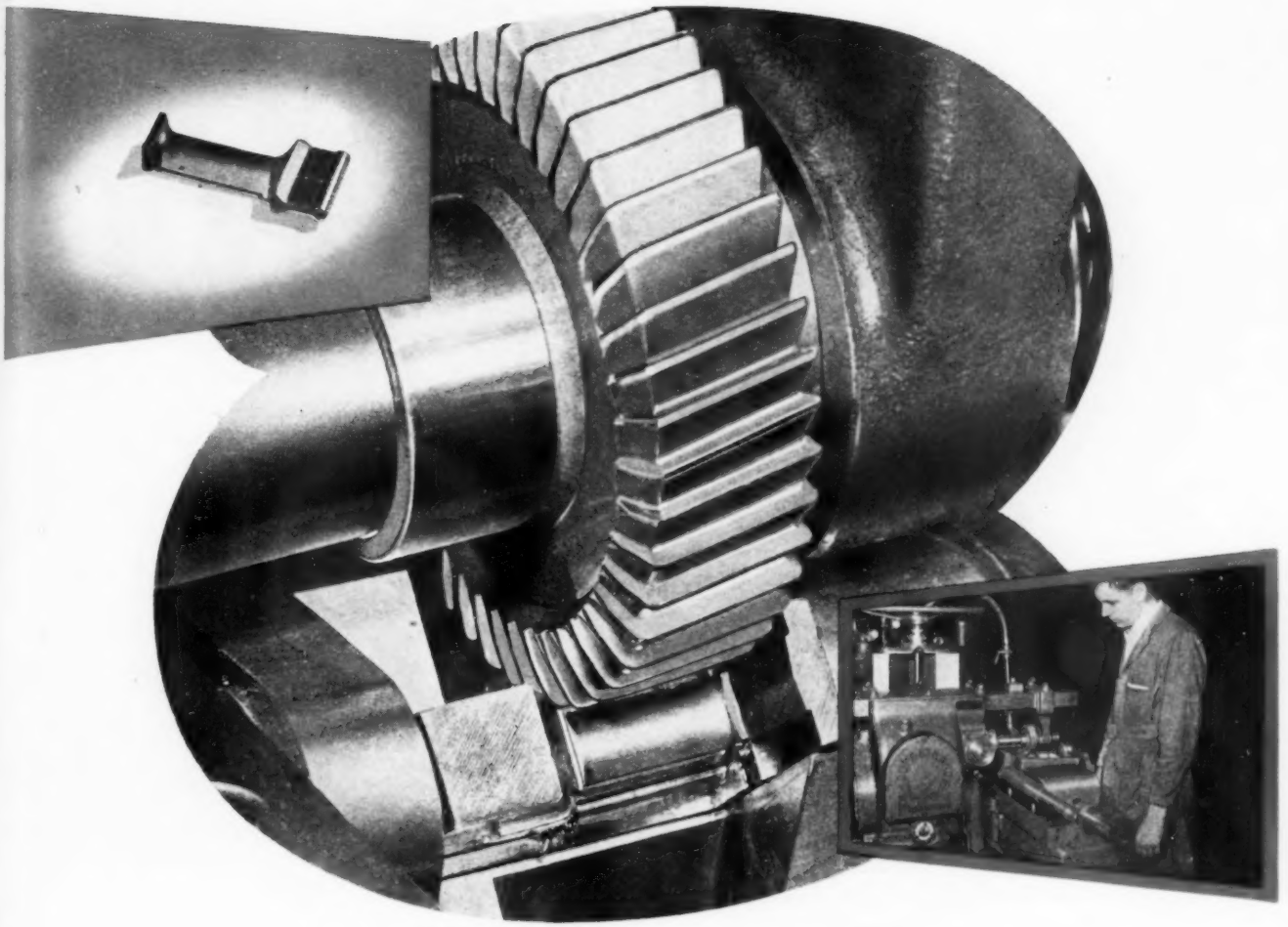
A variety of tool holders are also shown. These are straight and angular types, also an adjustable type for the fixed center type head. These have also been made heavier throughout and provided with cutting tools of very heavy cross sections.

Acme Turret Lathes are made in bar capacities from 2" to 4½" diameter and in chuck capacities from 20" to 28" swing.

OUR ENGINEERS ARE AT YOUR SERVICE.



The ACME MACHINE TOOL CO.
... CINCINNATI, OHIO.



with B-C *Very Fine Finish on Tough Steel...* SPECIAL FORM MILLING CUTTER

ANY scratches or marks on the milled back surface of this piece will cause rejection, because it travels at a high rate of speed and imperfections on the surface may cause breakdown in operation. The piece is an important part of a vital war machine. Three milling operations are performed on a tough steel forging, the final step being shown above. The surface has two flat portions joined by a radius, and the fillet radii and the ends must blend smoothly and be as finely finished as the rest of the cut. The cutter used on this operation was *specially designed for the job* by experienced B-C small tool engineers. Its outstanding performance is full testimony of our engineering department's ability to design Better Cutters. You, too, can profit from this engineering service by taking your cutter problems to your Barber-Colman representative, or by sending the data directly to us.

PRODUCTION DATA

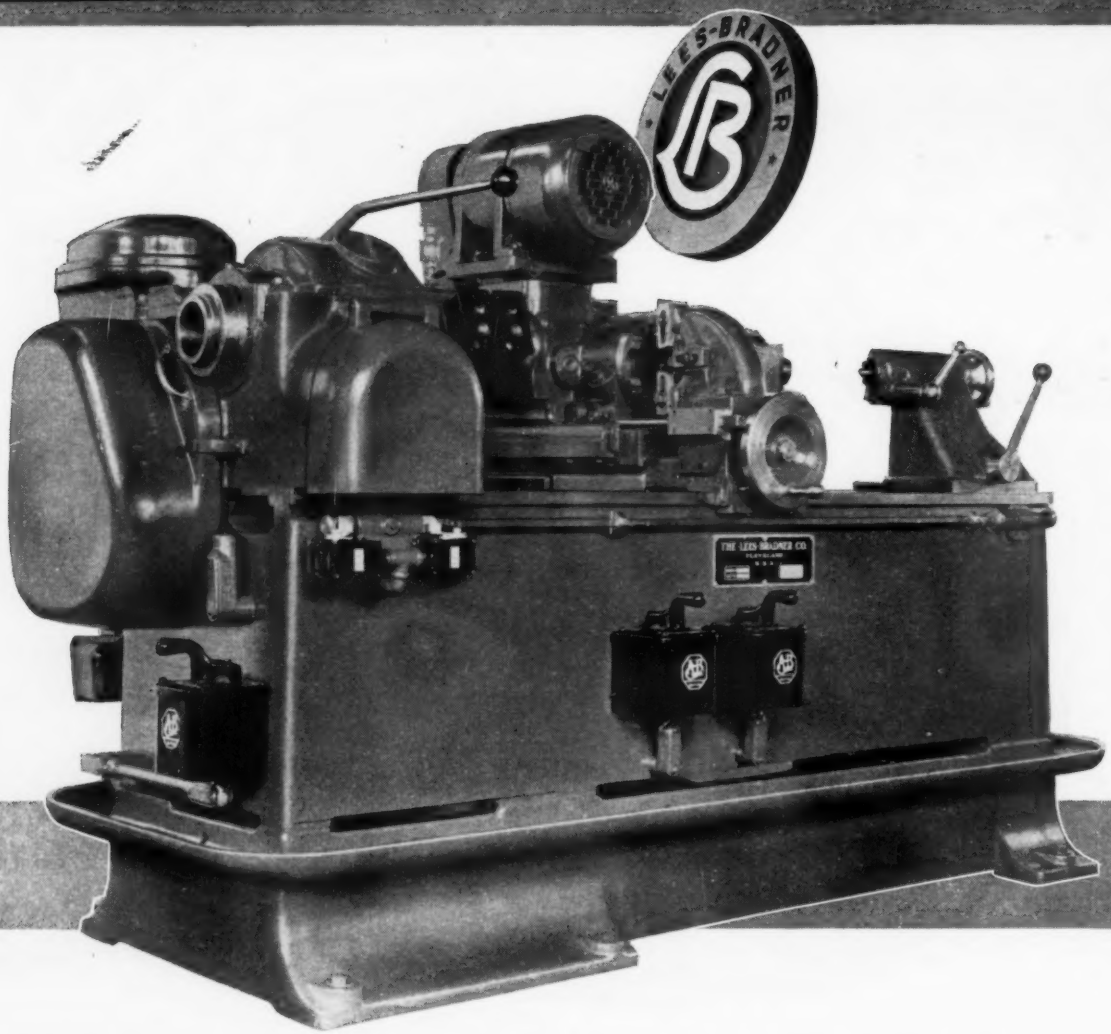
Material—Tough steel, work hardens.
Feed—5⅛" per minute.
Cutter Speed—36 R. P. M.
Stock Removal — Width—1-¼".
Depth—.040".
Machine—Sundstrand No. 1 Rigidmil, Special table and tooling.
Holding Means—Special fixtures.
Production—70 pieces per hour.
Pieces per cutter sharpening 1,500.
Improvement in time over former method —Was 34 pieces per hour.

Buy War Bonds

BARBER B-C COLMAN PRODUCTS
HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

Barber-Colman Company

GENERAL OFFICES AND PLANT • 201 LOOMIS STREET • ROCKFORD, ILLINOIS, U. S. A.



NOT JUST HOW MANY BUT HOW GOOD THREADS

Lees-Bradner

MODEL LT THREAD MILLER

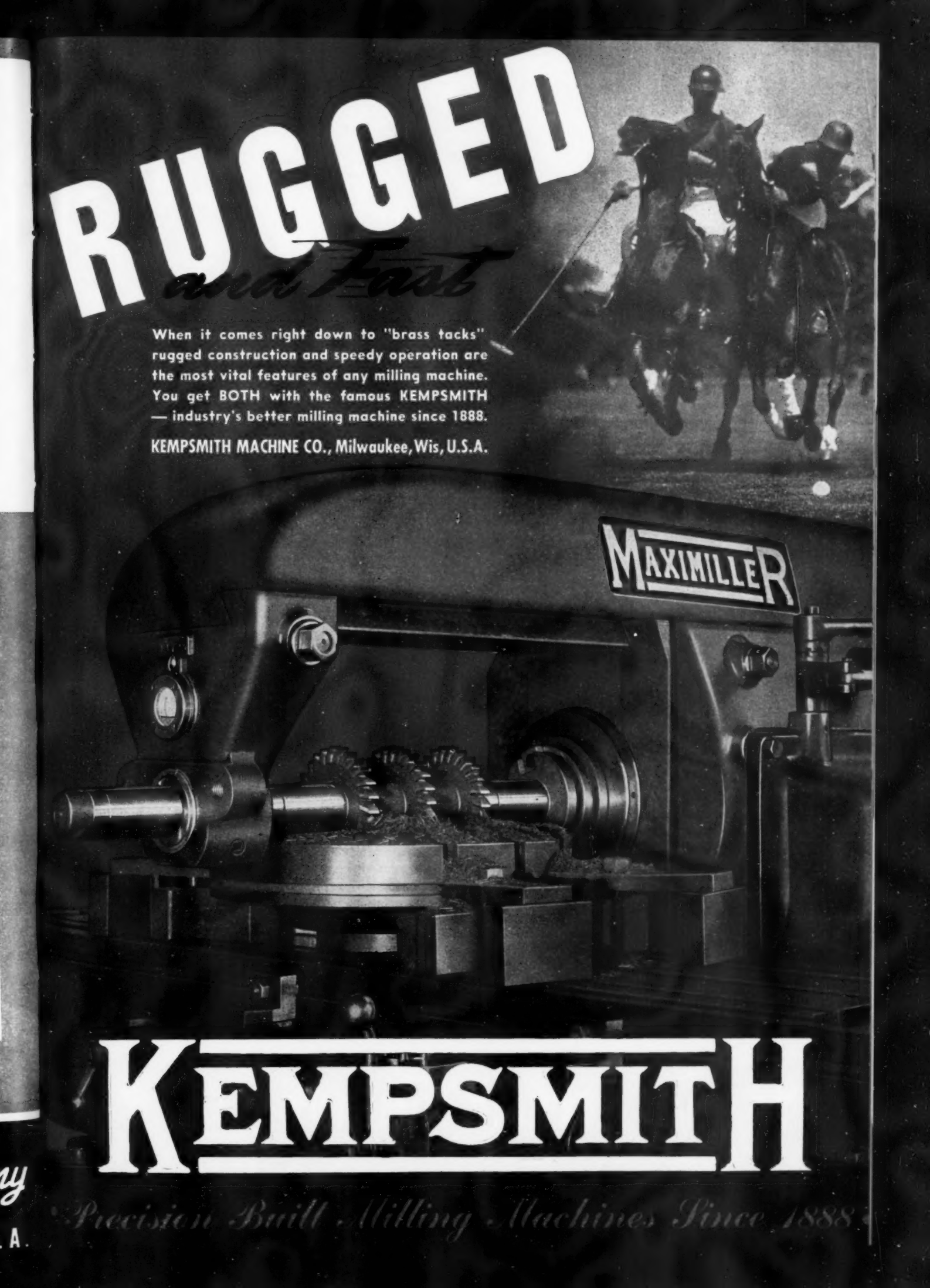
● With the call for greater and greater production there is along with it an insistent demand for more and better threads as well. The numerous precision thread operations performed on Model LT Thread Millers in a wide range of plants, speaks well for this sturdy, accurate Thread Milling Machine.

The Model LT machine is suitable for internal and external work, either with disc or ring (hob type) cutters on work up to 6″ in diameter, the tool being rated at 1″ circular pitch in steel.

Why not contact the Lees-Bradner tool Engineer for information on this machine as applied to your thread requirements?

The **LEES-BRADNER** *Company*

CLEVELAND. OHIO. U.S.A.


RUGGED
and Fast
When it comes right down to "brass tacks" rugged construction and speedy operation are the most vital features of any milling machine. You get BOTH with the famous KEMPSMITH — industry's better milling machine since 1888.
KEMPSMITH MACHINE CO., Milwaukee, Wis, U.S.A.
MAXIMILLER
KEMPSMITH
Precision Built Milling Machines Since 1888

FAR EASIER OPERATOR TRAINING

—experience of a hundred users of the DEVLIEG JIGMIL

Experience of more than a hundred users of the DeVlieg Jigmil has proved that operator training is far easier with this machine—because the Jigmil has built in features of quality that do not require a compromise with operator skill to produce accurate work in high production.

Every frequently used function of the machine is controlled in the master switch on the spindle head—at the operator's fingertips. These include:

Spindle start, stop and reverse.

Power vertical feed and rapid traverse movement.

Power horizontal feed and rapid traverse movement.

Power automatic table retraction and repositioning.

Power feed and rapid traverse to bar movement.

The operator never has to take his eyes off the work—never has to look at controls during operation. The machine is so convenient it gives greatly simplified response to the operator's skill.

An operator learns rapidly—frequently reaches full production of high quality in a week or two.

NEW TYPE MACHINE

Spacing accuracy of a jig borer . . . performance qualities of a milling machine . . . convenience and flexibility of a horizontal boring mill.

New speed of operation—many machines show 75% greater average daily productivity.

Write for Circular

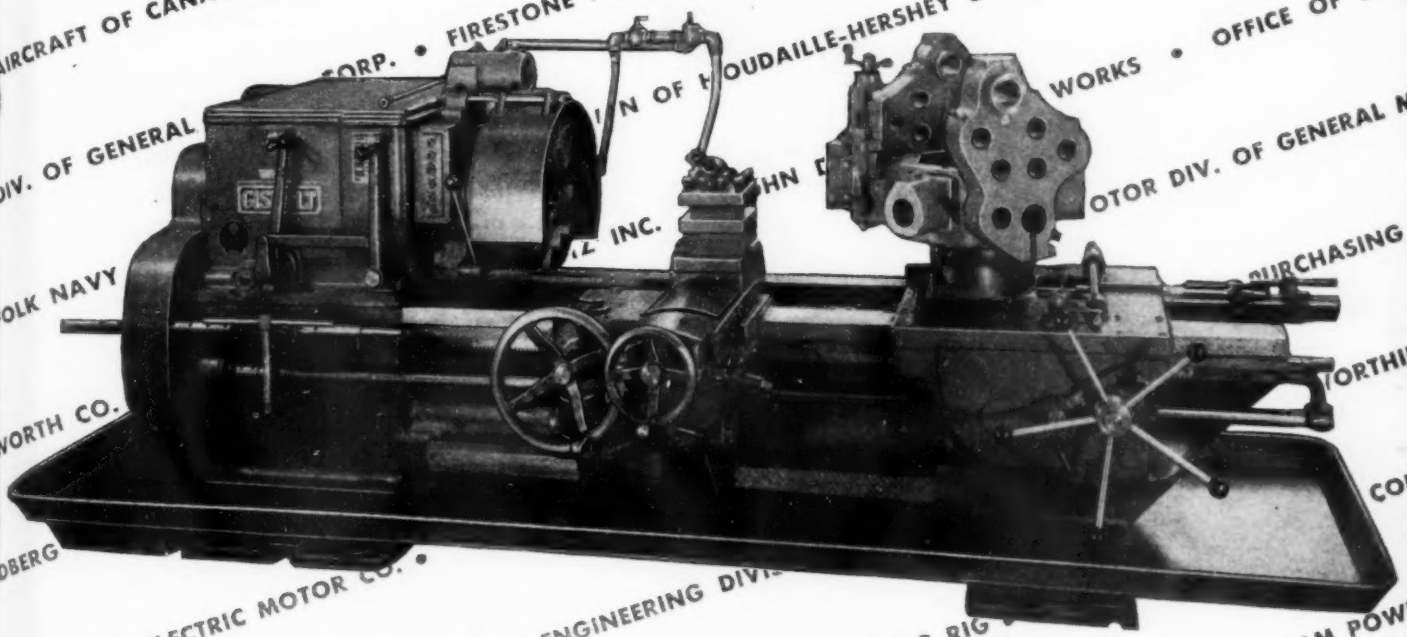
DE VLIEG MACHINE COMPANY

450 FAIR AVE. FERNDALE (DETROIT) MICHIGAN

DEVLIEG MACHINE TOOLS

Patronage of world-known names

is significant



GISHOLT 3-R AND 4-R SADDLE-TYPE TURRET LATHES

The immediate acceptance of these new Gisholt lathes by leading manufacturers, indicates the sound engineering principles they embody and the important contribution they are making to the war effort.

The Gisholt 3-R and 4-R models are large, saddle-type turret lathes, built in two sizes: 21″ and 24″ chucks; 5¼″ and 9¼″ spindle bores. Literature on request.

GISHOLT MACHINE COMPANY
East Washington Avenue • Madison, Wisconsin

VERY EARLY DELIVERIES

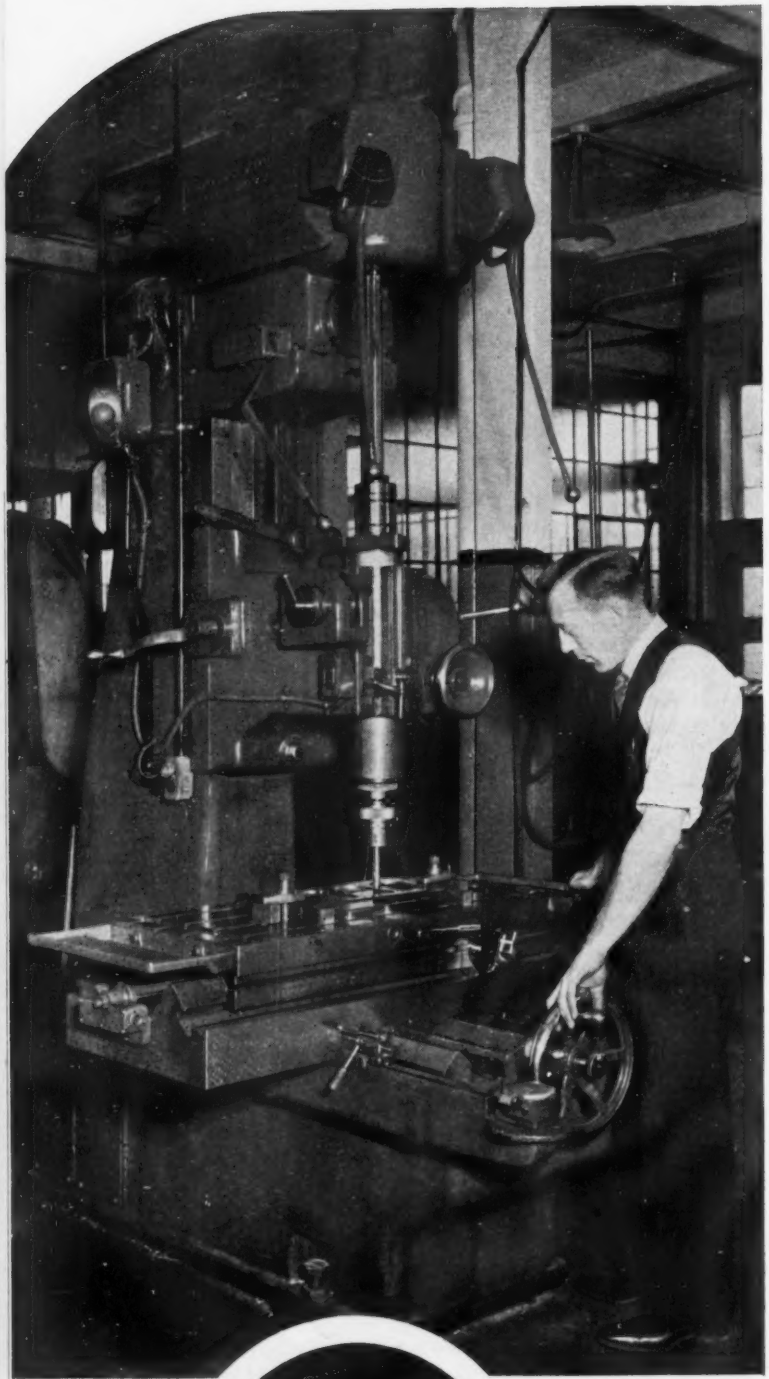
GISHOLT

Look Ahead—Keep Ahead With Gisholt Improvements in Metal Turning

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES

FOR INCREASED PRODUCTION

FOSDICK *Jig Borers*



ARMY E NAVY

• This is a sturdy, accurate, easily operated machine particularly versatile in the number and types of jobs it will handle. It is a most practical unit for precision boring and drilling of jigs—fixtures and production parts.

It is specifically suited to tool room work requiring extreme accuracy and may be used for duplicate operations on production jobs where it is not economical to use jigs and fixtures.

Illustrated is a Fosdick Jig Borer performing a boring operation in the plant of a mid-western tool shop.

For flexibility—ease of control—and ultimate economy make your next Jig Borer a Fosdick.

Built in two sizes the 30 and 30-A. Ask for Jig Borer Bulletin J.B.A. for Specific Information.

FOSDICK MACHINE TOOL COMPANY
CINCINNATI · · · OHIO

Photo Courtesy of Boeing Aircraft

ON THE LINE THAT LEADS TO...

Berlin

Mult-Au-Matics are furnishing parts for guns, planes, tanks, ships, shells, bombers, and are multiplying the output of each worker by the multiple spindles of each machine . . . more output with fewer men. Bullard Mult-Au-Matics —and Vertical Turret Lathes too—are big essential factors in Ordnance production.

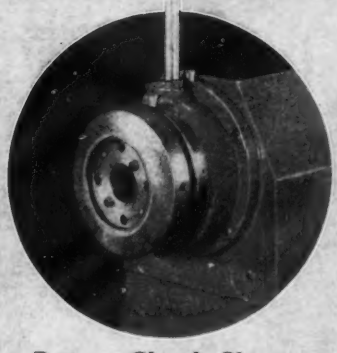
Bullard wants to be certain that every one of their machines does its magnificent best towards victory. Consult us freely on your [illegible] problems.

The Bullard Company
BRIDGEPORT
CONNECTICUT

RIVETT

918 HAND SCREW MACHINE

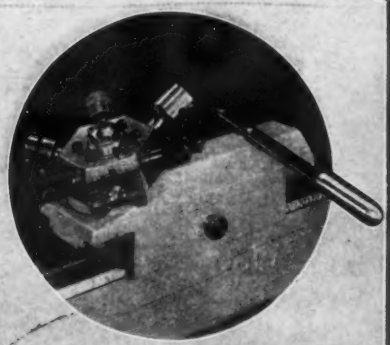
Capable of Thousands of Jobs Now Produced on Heavy, Costly Machines



Rotary Chuck Closer

Push-Out Collet Adaptor

Slide Rest Turret Post

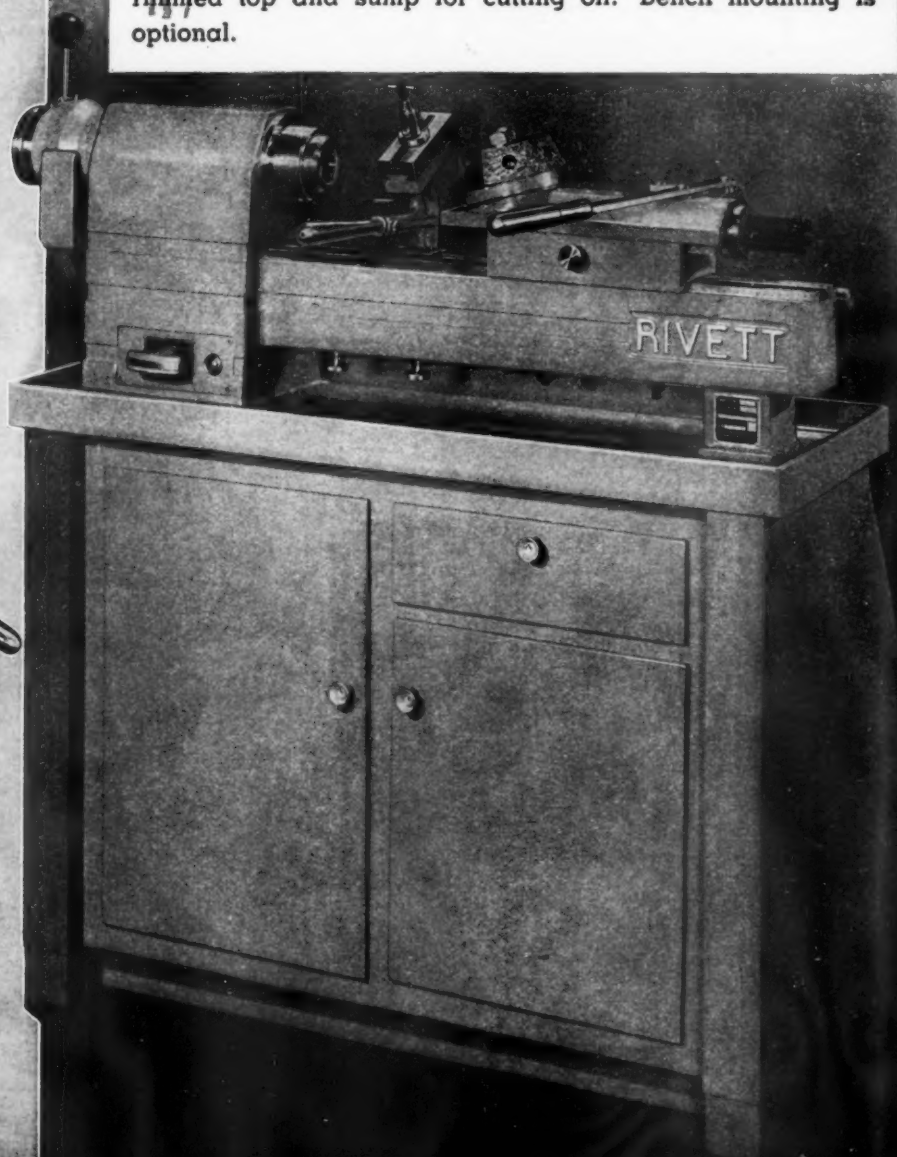


Six Station Turret

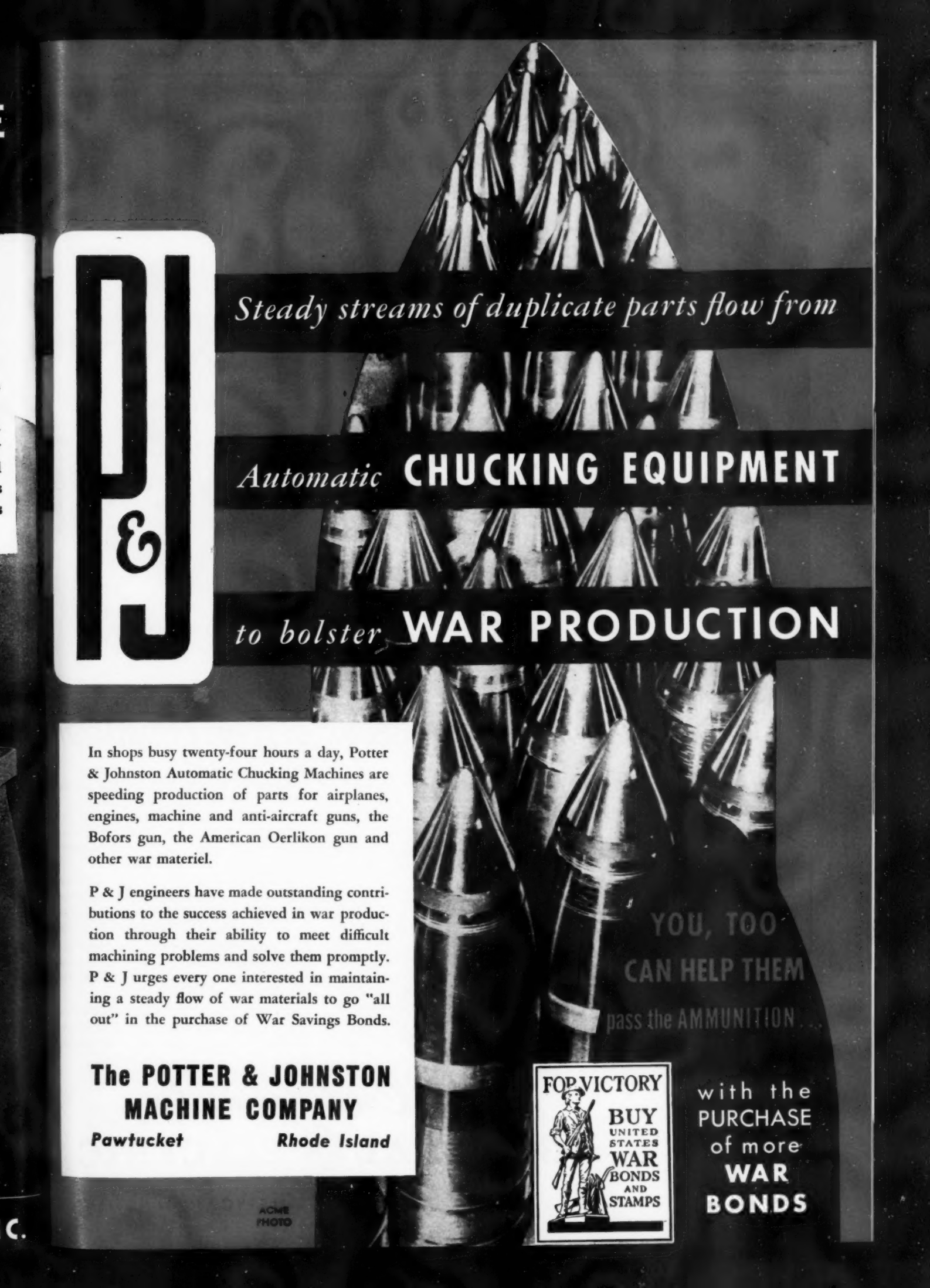
For Further Description
Write for Bulletin 918

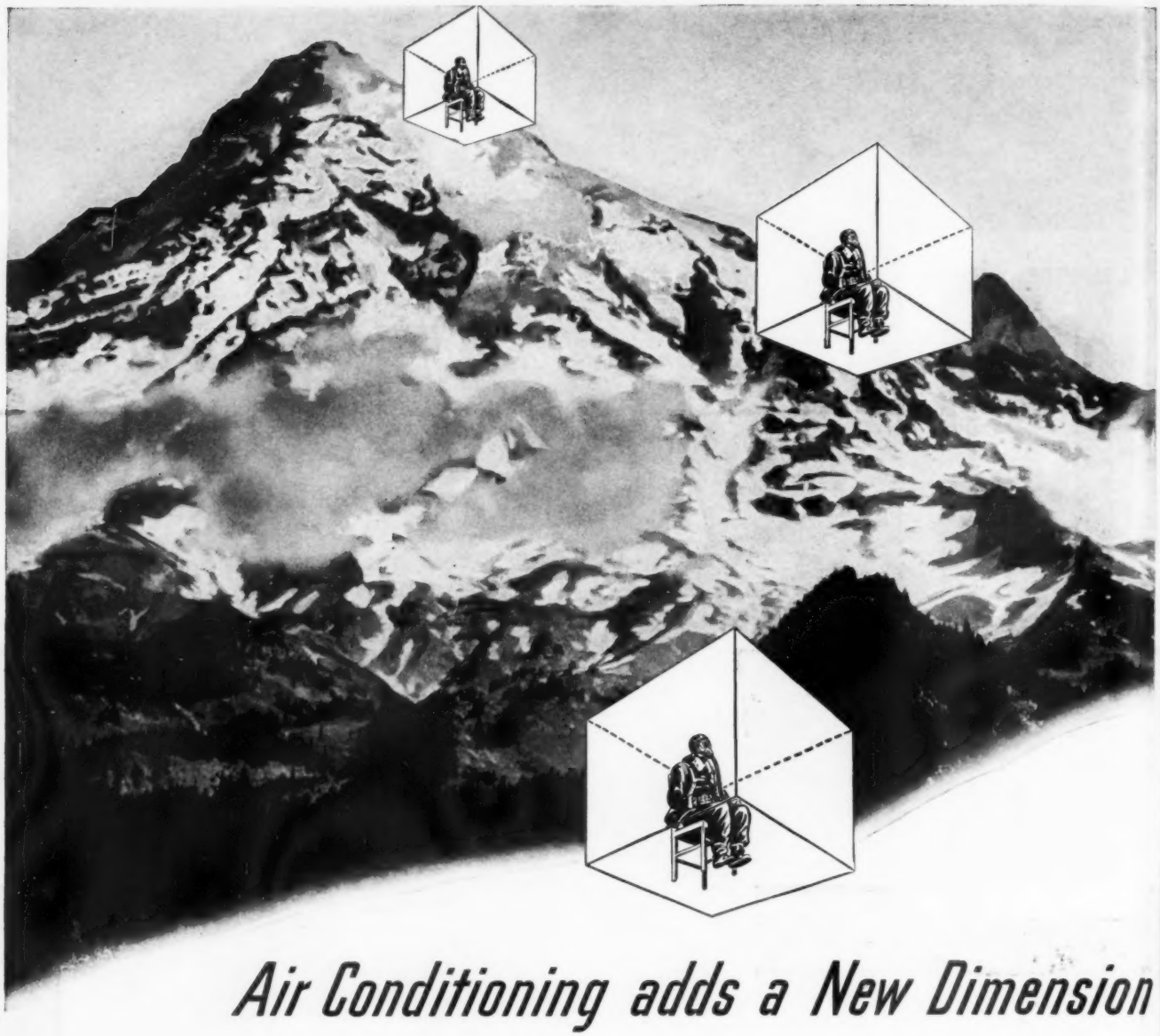
- The Rivett No. 918 Hand Screw Machine incorporates precision balanced design and operating features to make it an efficient producer on small duplicate parts. Work requiring up to eight successive operations can be finish-machined at one chucking. Bar stock passed through spindle may be held in push-out collet, while work individually chucked may be held in draw-in collet, step chuck or jaw chuck. In combination with six turret operations, double tool slide may be set up for straight or taper turning, forming or cutting-off.

Other combinations are available including boring bar for internal or external threading, as illustrated, or compound slide rest with turret tool post. Steel cabinet mounting has rimmed top and sump for cutting oil. Bench mounting is optional.

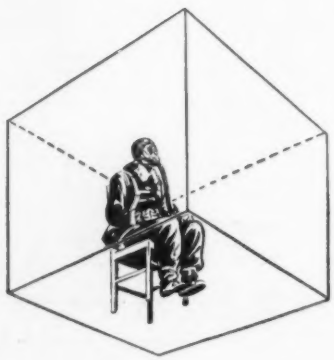


RIVETT LATHE & GRINDER INC.


P & J
Steady streams of duplicate parts flow from
Automatic CHUCKING EQUIPMENT
to bolster WAR PRODUCTION
In shops busy twenty-four hours a day, Potter & Johnston Automatic Chucking Machines are speeding production of parts for airplanes, engines, machine and anti-aircraft guns, the Bofors gun, the American Oerlikon gun and other war materiel.
P & J engineers have made outstanding contributions to the success achieved in war production through their ability to meet difficult machining problems and solve them promptly. P & J urges every one interested in maintaining a steady flow of war materials to go "all out" in the purchase of War Savings Bonds.
The POTTER & JOHNSTON MACHINE COMPANY
Pawtucket Rhode Island
ACME PHOTO
YOU, TOO CAN HELP THEM
pass the AMMUNITION
FOR VICTORY
BUY UNITED STATES WAR BONDS AND STAMPS
with the PURCHASE of more WAR BONDS



Air Conditioning adds a New Dimension



Originally, people thought of air conditioning only in terms of *temperature*. It cooled the air on a warm day. Temperature was air conditioning's *first* dimension.

Then came a second dimension . . . *movement*. Air had to be moved . . . under control.

Then a third dimension . . . *humidity* . . . control of the amount of moisture in the air.

Then, air conditioning took on a fourth dimension . . . *dust exclusion*.

And now, air conditioning is cooperating in an important new field . . . controlled air *pressure*. This is needed for the testing of men and equipment under the conditions of stratosphere flying.

Today, air conditioning faithfully reproduces *exact climates* . . . from the parched heat of the Sahara to the frigid cold of Northern Russia. The equipment that does this must be more flexible, more compact than ever before . . . with precise control of temperature and humidity.

This equipment . . . from General Electric . . . speeds up America's war effort. When peace comes, this improved air conditioning will become available for many new uses.

Then, as now, look to General Electric as the outstanding supplier of up-to-date air conditioning and industrial refrigeration equipment of all kinds.

Air Conditioning and Commercial Refrigeration Department, Division 434, General Electric Company, Bloomfield, New Jersey.

Air Conditioning by

GENERAL ELECTRIC

MID-WEST OFFERS FREE LAB SERVICE

The MID-WEST ABRASIVE COMPANY offers FREE laboratory service to manufacturers of precision parts who have to comply with rigid government specifications on surface finish and tolerance. You are invited to use this service – anytime.

MID-WEST'S laboratory, located in our Detroit plant, is equipped to measure depth of scratch down to one-tenth of a microinch – to determine the flatness or smoothness of your part quickly and accurately. Established primarily as a contribution to the war effort, this FREE service is open to ANY manufacturer who cares to use it.

Just send us your sample part. We will return it to you along with our findings on flatness and profile. If it is found to be not optically flat or sufficiently smooth we will (upon request) make it flat or smooth for you. There will be NO CHARGE. In order to speed up this service we suggest that you identify your metal when shipping parts for our inspection.

MID-WEST ABRASIVE COMPANY

Manufacturers of DEPENDABLE Abrasives

1960 E. MILWAUKEE AVENUE DETROIT, MICHIGAN

Mid-West

★ *Honing Stones*
★ *Superfinishing Stones*
★ *Grinding Wheels*
★ *Emery Cloth*
★ *Sandpaper*

Mid-West Abrasive Company,
1960 E. Milwaukee Avenue,
Detroit, Michigan

Gentlemen: Please send me additional information on Mid-West Micro Bond honing and superfinishing stones.

Name _____

Company _____

Address _____

_____

SAVE TIME
TO SPEED VICTORY

★ BUY U.S. WAR BONDS ★

Write for our new Catalog No. 100C showing lathes for every class of work — engine lathes, toolroom lathes, and turret lathes.

SAVING TIME is of vital importance, for every second saved hastens victory and brings us that much closer to peace.

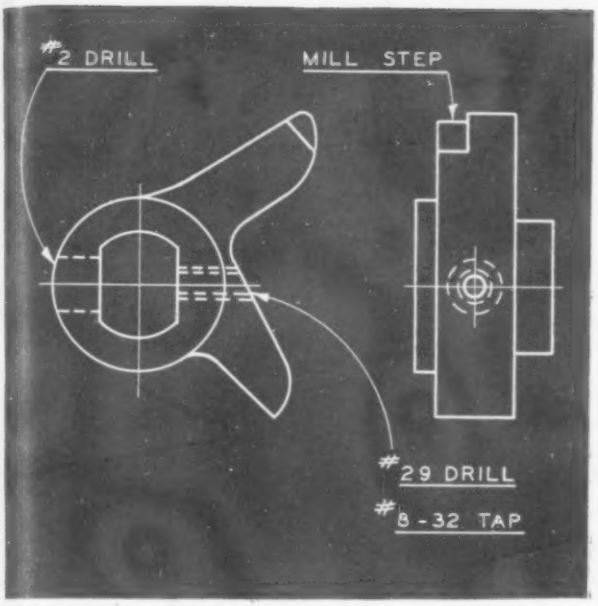
Time is saved and precious machine hours are gained on many operations through the use of South Bend Lathes. Their wide range of spindle speeds permits machining work with maximum cutting tool efficiency. Their versatility keeps setup time to a minimum — adding hours to machine output on short runs or when product specifications are frequently changed. Conveniently placed, smoothly operating controls contribute to an ease of operation that reduces fatigue and increases manpower efficiency.

Most important of all time-saving advantages is South Bend's dependable precision which assures maximum production even when extremely close tolerances must be maintained.

ARMY E NAVY

SOUTH BEND LATHE WORKS

South Bend, Indiana Lathe Builders For 36 Years



THIS IS A FLEXIMATIC AUTOMOTIVE JOB!

FLEXIMATIC

by KINGSBURY

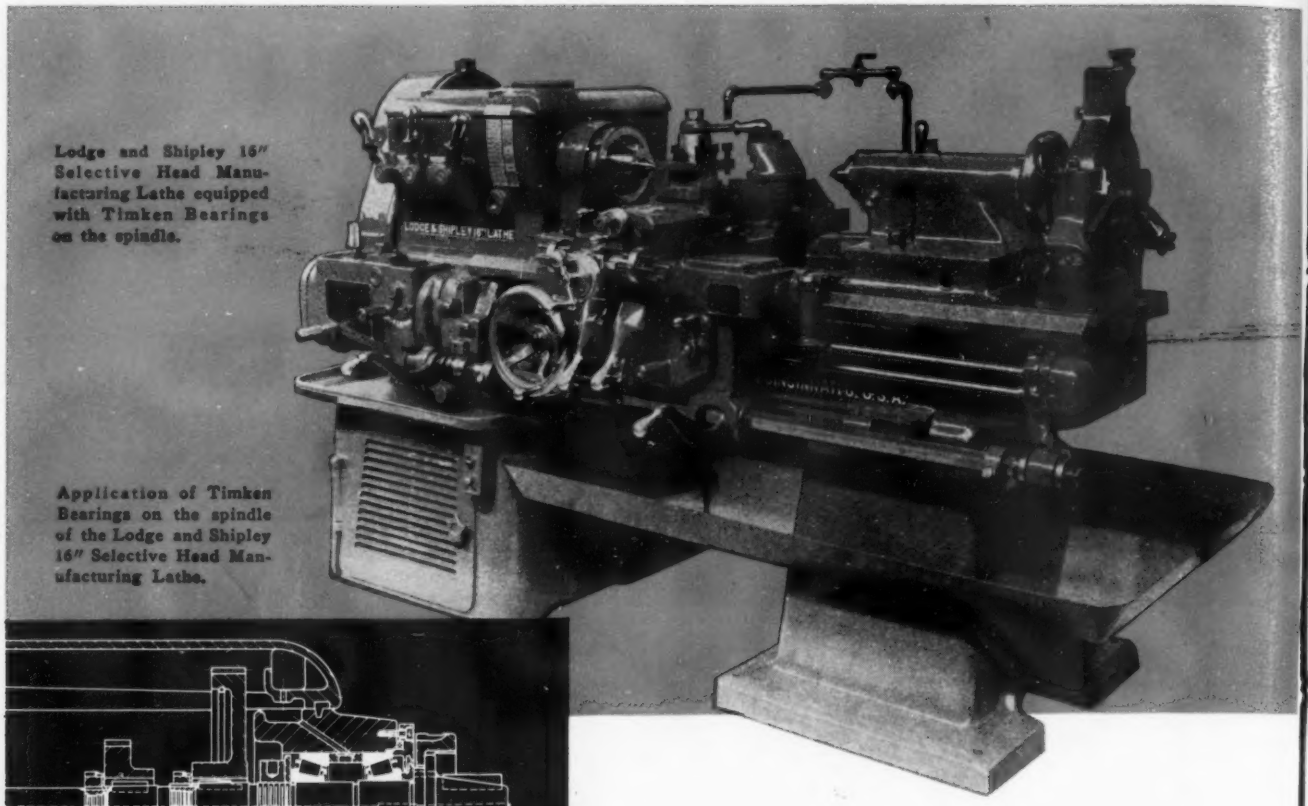
Flexible, Automatic, and Fast . . . !

Even such a small part as an automobile door latch presents an opportunity for savings when a Kingsbury FLEXIMATIC is used to produce them. The machine illustrated performs four operations—drilling two holes, tapping and milling—finishing these brass forgings at unbelievably high speeds. And, in adding to the ease and economy of FLEXIMATIC operation is the fact that this machine doesn't even have to be unloaded! The operator merely loads the work and clamps it. It is automatically unclamped and ejected.

Kingsbury FLEXIMATICS are made up of standard units for drilling, milling, tapping, etc.—as many as necessary—mounted in any position on one of several types of standard bases. This Kingsbury method of standardizing the various units of assembly results in a machine that can easily be changed to meet changes in design and production . . . a FLEXIBLE, an AUTOMATIC, a FAST production machine.

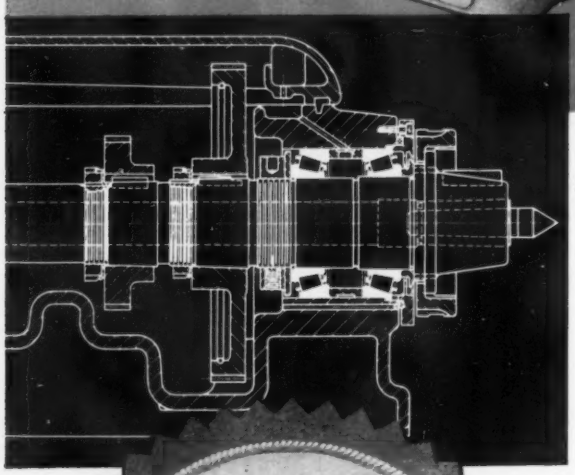
KINGSBURY MACHINE TOOL CORPORATION

KEENE NEW HAMPSHIRE U S A



Lodge and Shipley 16" Selective Head Manufacturing Lathe equipped with Timken Bearings on the spindle.

Application of Timken Bearings on the spindle of the Lodge and Shipley 16" Selective Head Manufacturing Lathe.



Put more Timken Bearings in your machine tools to increase speed, precision and endurance for the requirements of Victory.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

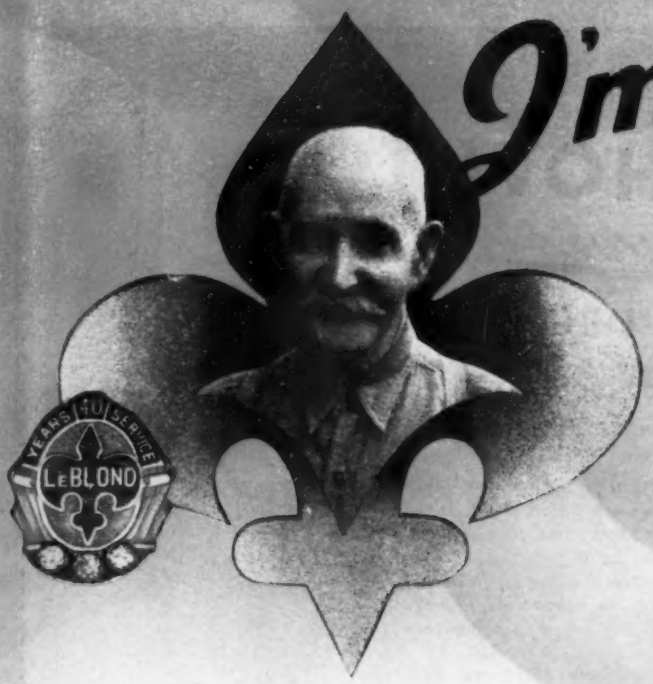
"ALL THERE IS IN BEARINGS"

The use of Timken Tapered Roller Bearings on machine tool spindles has become so widespread as to be virtually standard practice; it assures rigid, chatter-free spindle operation—and consequently greater precision.

Two Timken Bearings are used at the front ends of the spindles in Lodge & Shipley Lathes to provide utmost freedom of spindle rotation, maximum spindle rigidity and full protection against radial, thrust and combined loads. They are largely responsible for the accuracy for which Lodge & Shipley machines are well known.

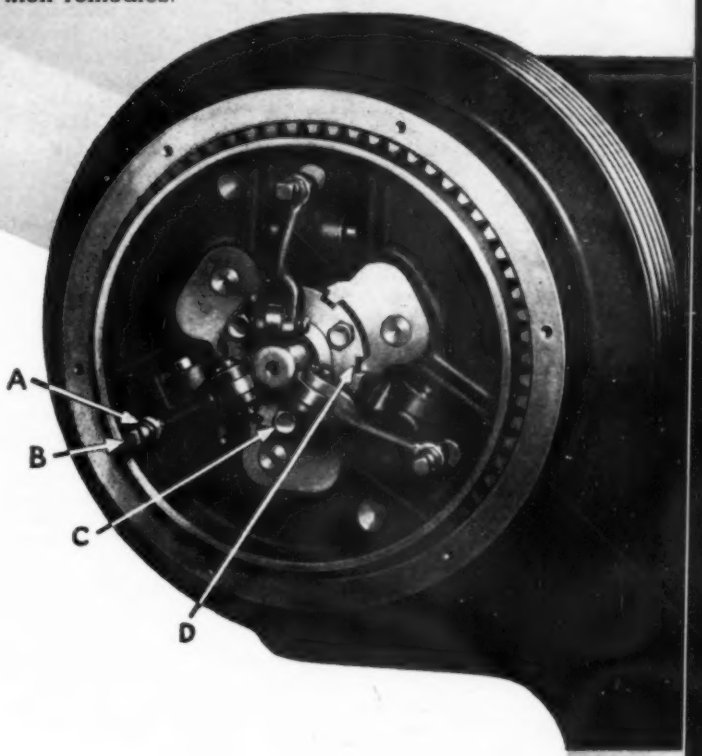
Besides having Timken Bearings on the spindles, many modern heavy duty machines—including lathes, milling machines, grinding machines, drilling machines and boring machines have them at other points of friction and hard service. This not only makes for still *better operating* machines, but also *better selling* machines; for the trade-mark "TIMKEN" indicates quality to equipment buyers everywhere. The Timken Roller Bearing Company, Canton, Ohio.

I'm Tellin' You··



No. 10 in a Series of Tips on "Keeping 'em Turning"
by Tom Toker, 40 years at LeBlond

Any lathe requires adjustment from time to time. How often depends on the type of operation and sometimes on the operator. Although it is seldom needed, the clutch is one spot to watch. If I tried to explain the "whys and wherefores" of the mechanics involved in the LeBlond clutch, it would take several of these pages, which the "front office boys" assure me can't be bought with marbles. So without going into details, here are two symptoms of trouble and their remedies:



Loss of power — When the lathe slows under cut and the flow of power is irregular or jumpy, it's a pretty fair sign that the clutch is slipping.

Here's the remedy:

1. Put clutch in engaged position.
2. Drain oil through plug at bottom of clutch cover.
3. Remove the six screws to take off cover.
4. Loosen three lock nuts on clutch fingers (A).
5. Turn three screws equal degrees to the right (B).
6. Tighten three screws (B) until belt slips when spindle is blocked. With even adjustment, push rod will run dead center.
7. Tighten lock nuts (A).
8. Replace cover, refill with oil.

Hot clutch box — When there is too little clearance between the clutch plates while the lathe idles, friction overheats the non-circulating oil, breaking down its lubricating properties. When this happens, the cover plate will be hot to the touch.

Here's what to do:

1. With the oil drained, cover plate removed and clutch engaged, remove three screws (C).
2. Use a spanner wrench to tighten lug nut (D).
3. After checking manual for exact number of turns, back off lug nut. Check with feeler gauge the space specified between clutch hub and adjusting nut.
4. Replace screws (C) to draw clutch assembly tight against nut in proper operating position.
5. Replace cover plate and refill with oil.

ARMY E NAVY

THE R. K. LeBLOND MACHINE TOOL CO.

CINCINNATI, OHIO

Largest Manufacturer of a Complete Line of Lathes

THIS IS HOW TO *Prevent* CARBURIZATION or DECARBURIZATION

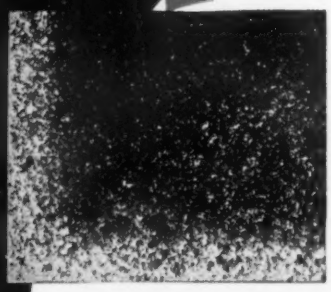


Fig. 1+2. Shows sample of carburized SAE 1015 Steel, treated on top and right hand edges to prevent carburization, as compared with untreated edges.

To prevent carburization or decarburization use Park's No-Carb liquid paint. It is a ready-to-use premixed product that requires no further additions or dilutions for application.

No-Carb is an excellent paint for use on finished molybdenum high-speed tools, or alloy steels, before and after fabrication, for prevention of decarburization (see photograph at right).

When applied to clean surfaces of low-carbon steels, No-Carb prevents carburization in selected areas (see photograph at left).

There is also a time saving advantage in using No-Carb, because on most jobs it can be applied by brushing, dipping or spraying directly from the can after stirring—it is not necessary to add to or dilute it.

For further information, prices, and delivery promises wire or write today.

Fig. 2+2. Shows sample of molybdenum high-speed steel, hardened after treatment of top and right hand edges with No-Carb, while other two edges are unprotected.

★ ★ ★

Thirty-two years ago the Park Chemical Company began the manufacture of heat treating compounds. Today, Park's *Laboratory Controlled Products* are recognized for high quality by manufacturers who demand the best results in their heat treating departments. With the recent installation of one of the most modern heat treating and chemical laboratories in the country, Park has taken another step forward in giving its customers the advantage of better metallurgical analysis of their heat treat problems. This adherence to *Laboratory Controlled Products* has built for the Park Chemical Company an enviable reputation for selling products that are pre-tested for each particular job. This effects a saving to Park customers by eliminating trial and error methods on production lines.

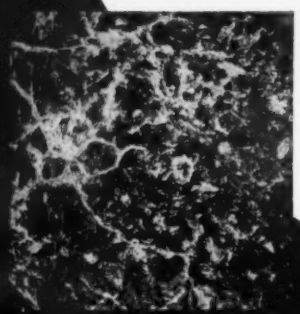


Fig. 3 - 50. Shows steel sample edge *unprotected* by No-Carb, where normal carburization has taken place.

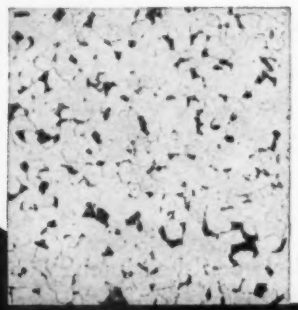


Fig. 4 - 50. Shows opposite edge of same sample, *protected* by No-Carb, where no carburization is evident.

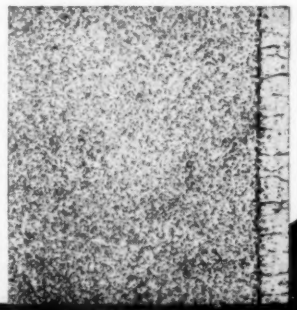


Fig. 5 - 50. Shows edge of hardened steel, *unprotected*, with decarburization evident on same.

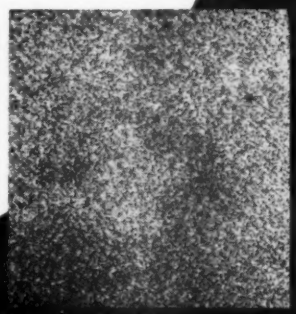


Fig. 6 - 50. Shows opposite edge of steel *protected* with No-Carb, where no decarburization is found, indicating excellent surface protection.

Park

PARK CHEMICAL CO.

DETROIT . . . MICHIGAN

● Liquid and Solid Carburizers ☆ Cyanide, Neutral and High Speed Steel Salts ☆ Lead Pot Carbon ☆ Charcoal ☆ Coke ☆ No Carb. ☆ Carbon Preventer ☆ Quenching and Tempering Oils ☆ Drawing Salts ☆ Metal Cleaners ☆ Liquid Grain Cement

8082 MILITARY AVE. DETROIT, MICH.

HARDINGE

HARDINGE Horizontal-Vertical Collet Index Fixture with Sub-Base and Tailstock for PRODUCTION WORK

SPECIFICATIONS

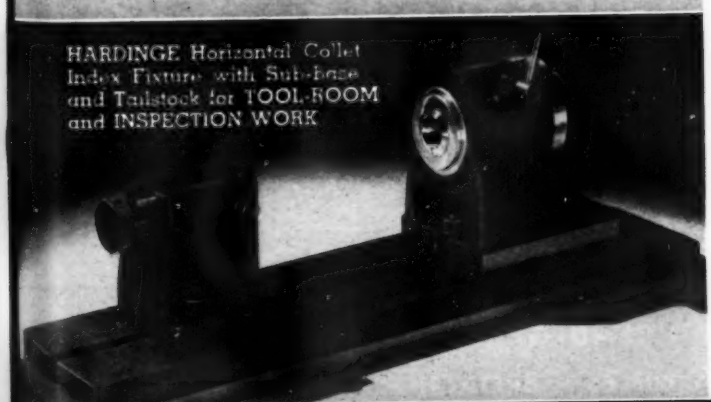
Take standard 1" capacity 5C HARDINGE Collets. Available with either a 20 or 24 hole hardened and ground index plate The sub-base is 24-½" x 5-⅛".

COLLET INDEX FIXTURES

Time and time again, you have experienced the need for a fixture to quickly hold work **accurately** and, at the same time, provide a means for indexing. HARDINGE Collet Index Fixtures fulfill those requirements **economically** and there is planned interchangeability of the various units for application to a wide variety of work.

These fixtures are for direct application or for use with the sub-base on your milling machines, grinders, shapers and drill presses. The index head shown above with sub-base and tailstock can be used in a horizontal or vertical position, the index plate has preselector screws so that holes not required for a particular job can be "blinded". The lever facilitates chucking of work on a production basis.

Ask for complete bulletin.



HARDINGE Horizontal Collet Index Fixture with Sub-Base and Tailstock for TOOL-ROOM and INSPECTION WORK

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR

HARDINGE
ELMIRA, N.Y.

Below: Ex-Cell-O's new catalog on precision machine tools, cutting tools, and other Ex-Cell-O precision products. Contains illustrations, descriptions, and specifications. A copy will be mailed free to any request on business letterhead. Ask for Ex-Cell-O Catalog No. 27121.

"We finish grind these fin it
...on EX-CELL-O th

PRECISION THREAD GRINDING, BORING AND LAPPING AC
GRINDING SPINDLES • BROACHES • CONTINENTAL CUTTING DO
EQUIPMENT • PURE-PAK CONTAINER MACHINE AIL

MANY industries depend upon EX-CELL-O Precision Thread Grinders for production of accurately threaded hardened parts for war work. Outstanding is the aircraft industry. Aircraft engine manufacturers in the United States are using precision thread grinders for threading parts such as cylinder barrels, crankshafts, propeller shafts, crankshaft bearing bolts, connecting rod bolts, tappet adjusting screws, etc. . . . EX-CELL-O precision thread grinders are so dependable that what formerly would have been considered very delicate threading operations on aircraft engine parts are now handled easily, with assured accuracy, high finish, production. . . . EX-CELL-O precision thread grinders grind fine threads directly from heat-treated blanks and finish grind coarser threads after heat treatment.

EX-CELL-O CORPORATION • DETROIT

fin itch threads from hardened solid blanks
-O Thread Grinders!"

XLO
EX-CELL-O *means* PRECISION

treme Accuracy In Form and
ad... *With High Production*

PPING ACHINES • TOOL GRINDERS • HYDRAULIC POWER UNITS
UTTING OOLS • DRILL JIG BUSHINGS • DIESEL FUEL INJECTION
HINE AILROAD PINS AND BUSHINGS • PRECISION PARTS

Above: One of nine styles of Ex-Cell-O Precision Thread Grinders—Style 33 Automatic.

STANDARD SUPER *Snap Gage*

With

SPHERICAL

Gaging Pins

that involve no condition of parallelism . . . .

YET PROVIDE *greater* ACCURACY IN PRECISION INSPECTION

A new contact principle . . . . simple and practical*

As mass production is accelerated, the need for faster, simpler, and *greater accuracy* of inspection becomes imperative. Snap gages are commonly used to control finer tolerances, but strain on the locking device distorts the frame thereby rendering the gage inaccurate. This distortion tilts the flat surfaced pins a few .0001" throwing them out-of-parallel to the common anvil, an important factor when tolerances are measured in .0001".

The STANDARD Super Snap Gage with its SPHERICAL gaging pins eliminates out-of-parallelism. This new spherical-contact principle involves no condition of sustained parallelism. The SUPER Snap Gage is easily set, requiring no simultaneous adjustment to a given dimension and to parallelism. It simplifies inspection, assures greater accuracy, and speeds production and inspection.

The return of out-of-parallel snap gages for correction is eliminated. Only pins and anvils need be held in reserve, instead of complete gages. The initial cost of the SUPER Snap Gage is no more. Pins are available as separate parts, to fit existing American Gage Design models.

(Pat. Pending)*

Send for Illustrated Folder

STANDARD GAGE CO., Inc.
Poughkeepsie, N. Y.

MASTER CRAFTSMEN MANUFACTURING precision GAGES AND INSTRUMENTS

Conventional Snap Gage with flat surfaced gaging pins. The tilt is exaggerated to make the diagram clear. Note that only at their edges do the gaging surfaces contact the piece be-

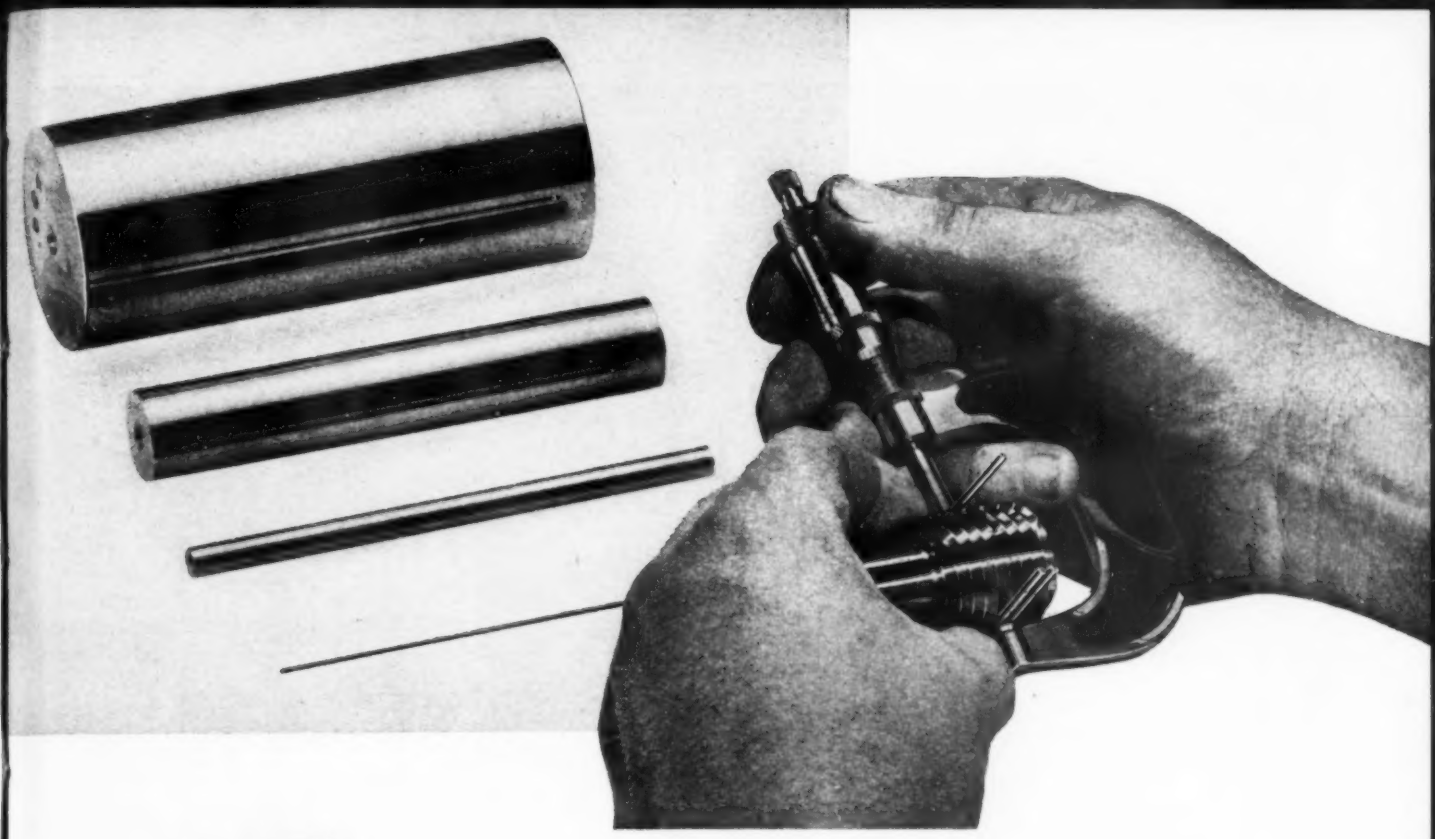
This illustration shows the Super Snap Gage with the pin shank at the same angle as in the diagram at the left. Note that the contact conditions are exactly the same as if the pin

•

IMMEDIATE DELIVERY from stock

•

Super Snap Gage mounted in a bench stand for convenience in checking.



THREAD MEASURING WIRES
A *Standard* FOR ACCURACY IN LEADING WAR PRODUCTION PLANTS

The wire system of thread and gear measurement is easy to use and gives exceptionally accurate results. Our Manual of precision measuring tools gives complete tables and simplified formulas for measuring all standard threads, splines and spur gears. Send for this valuable handbook!

Leading arsenals and war production plants know the importance of accuracy in thread and gear measuring. That is why so many of these plants are using Van Keuren Measuring Wires as standard equipment for measuring thread gages, taps, worms, splines and spur gears. Made in any size from 1.5708" down to .002" in diameter, they are guaranteed to be within .00002" for roundness and straightness and within plus or minus .000025" for size. Special sizes can be made to your specifications as to size and tolerances. Easy to use, VK Wires bring ultimate accuracy to your operations. Write for full details.

THE VAN KEUREN CO.
176 Waltham St., Watertown, Mass.

THE VK SYSTEM . . . Light Wave Equipment

23RD YEAR

Light Wave Micrometers · Reference Gage Blocks · Microgages · Taper Insert Plug Gages · Wire Type Plug Gages · Measuring Wires · Thread Measuring Systems · Gear Measuring Systems · Shop Triangles

NO SEVENTH INNING STRETCH

No easy stretch. No early leavers. No shoulder-shrugging, win-or-lose indifference. None of that! This is do or die War. And it isn't over yet. Not by many long shots, icy voyages, gruelling marches, epic flights, major maneuvers.

This is the time for exertion "beyond the call of duty". Because we know this at General Machinery Corporation, we keep on producing the machinery, engines, cannon, guns, with which, and because of which our boys will win.

Tense as we are, all of us—Americans—know that there is no seventh inning in this engagement to decide the world championship.

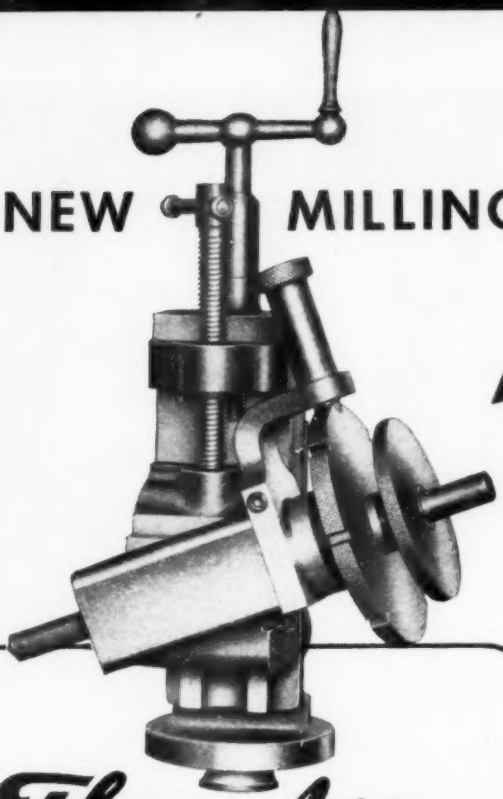
GENERAL MACHINERY CORPORATION

HAMILTON, OHIO

THE NILES TOOL WORKS CO.

THE HOOVEN, OWENS, RENTSCHLER CO.

GENERAL MACHINERY ORDNANCE CORPORATION



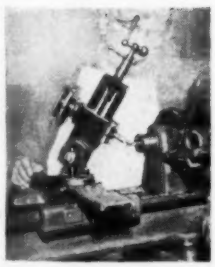
..A NEW MILLING FIXTURE WITH *Fool Proof* INDEXING

Thompson UNIVERSAL MILLING FIXTURE

Set this time saver up on any bench lathe — slip on a stock index plate — and the most inexperienced operator can produce indexed work with no chance for error through miscalculation.

The 3-way swing provides exceptional maneuverability, so that it readily produces a wide variety of end mills, special cutters, reamers, splines and punches. Plain milling of flat stock may also be accomplished by using the sturdy vise without indexing unit.

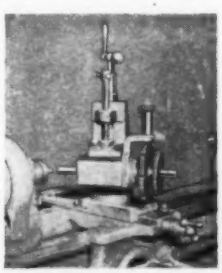
Awarded to AUTO-ORDNANCE CORPORATION for excellence in production of "Tommy Guns."



ndex Fixture tilted at 30° mill- ng end teeth in Taper Reamer.

Fixture and Base at right angles milling straight teeth in cutter.

se of Fixture on 30° angle illing end teeth in cutter.



End Mill operation showing work extended thru fixture.

AUTO-ORDNANCE *Corporation*

THOMPSON TOOL DIVISION

342 WEST PUTNUM AVENUE

GREENWICH, CONNECTICUT

WOMEN OPERATORS AND THE RIGHT TOOLS

ARCHER & SMITH
GETS UNINTERRUPTED PRODUCTION

ONE of the first tool manufacturers to employ women almost exclusively, Archer and Smith, Lexington, Kentucky, operates more than a score of Covel No. 15 Surface Grinders on continuous three-shift production. The women operators like No. 15's operating ease, convenient controls, clear vision and ample room to sit or stand at the work. "Quick Set-Up" saves priceless time because output consists largely of small runs averaging 20 to 25 pieces.

The many outstanding production features of Covel No. 15 (6"x18") Hand Feed Surface Grinder are fully described in Bulletin A93—write, wire or phone today for your copy and name of nearest dealer.

PROMPT DELIVERY TO WAR INDUSTRIES

Shorten Employee Training Time With Covel Equipment

Grinding Machinery Since 1874

COVEL INDUSTRIAL GRINDERS

COVEL MFG. CO., BENTON HARBOR, MICH.

METRO *Precision* SURFACE PLATES

ACCURATE SURFACES FOR TOOL AND GAGE MAKING, INSPECTION AND TESTING

★ *Surfaces carefully scraped and checked against master plates of known accuracy.*

★ *True plane surfaces resist deflection under load — retain accuracy indefinitely.*

★ *Wooden covers for scraped plates.*

★ *Deep ribs give plate rigidity and stiffness — prevents deflection from weight of work.*

★ *Four point supports insure use exactly as when surface was scraped.*

SURFACE PLATES

14" x 18"	*These sizes may be had planed only, grooved for lapping, or planed and hand scraped.*
18" x 26"	
24" x 36"	

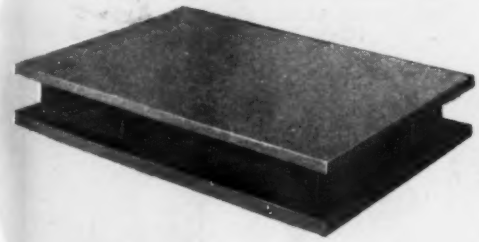
BENCH BLOCKS

10" x 14" x 2⅛"

Available in four different finishes

●

METRO DUPLEX BENCH BLOCK



● All Metro plates are made of close - grained, high - strength, cast Meehanite of high wear resistance. Distortion or change, after the surfaces have been scraped, is prevented by special treatment to relieve casting and machining strains.

METRO SURFACE PLATES AND BENCH BLOCKS ARE USED IN THE MAKING OF METRO PRECISION TOOLS AND GAGES -- *Write for Latest Catalog No. 101*

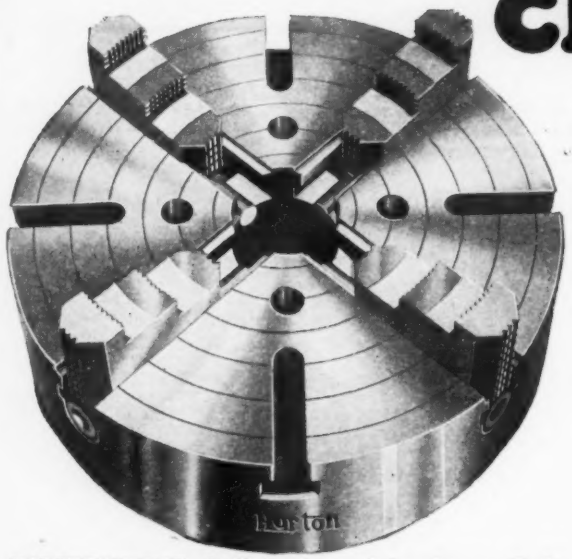
METRO

TOOL AND GAGE CO.

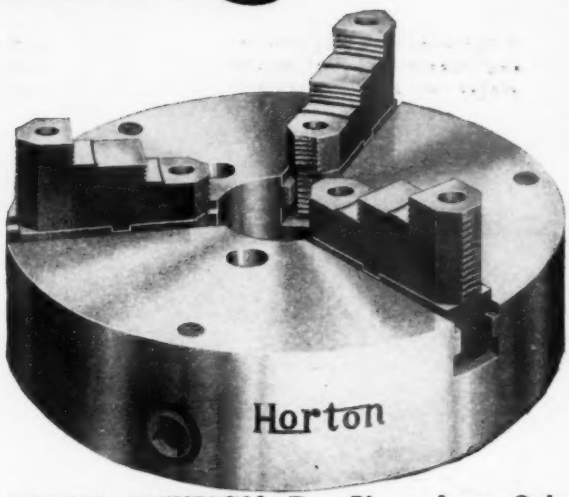
4240 PETERSON AVE.

CHICAGO, ILL.

Horton chucks



INDEPENDENT Solid Reversible Jaws Only

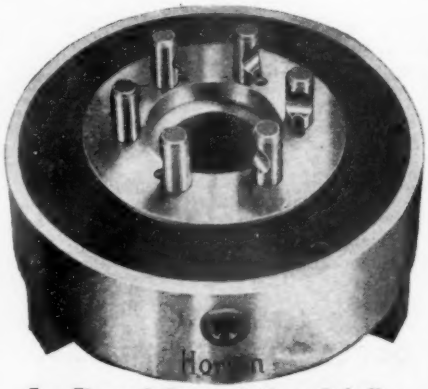


SCROLL UNIVERSAL Two-Piece Jaws Only

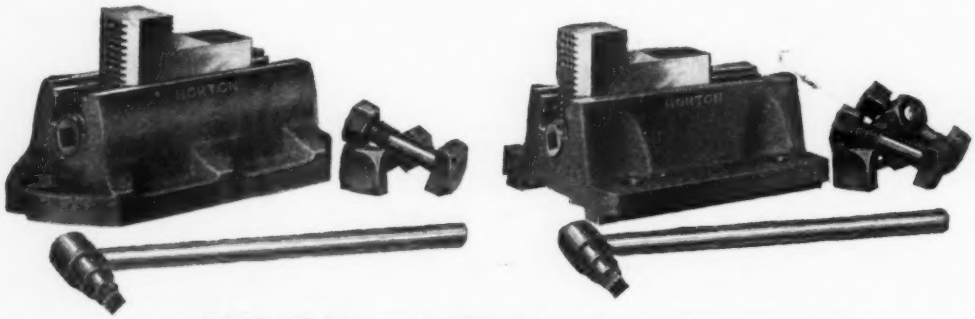
For Use With Intermediate Plates On Threaded Spindles

For Key Drive Tapered Nose Spindles

War Production Limited To These Essential Chucks



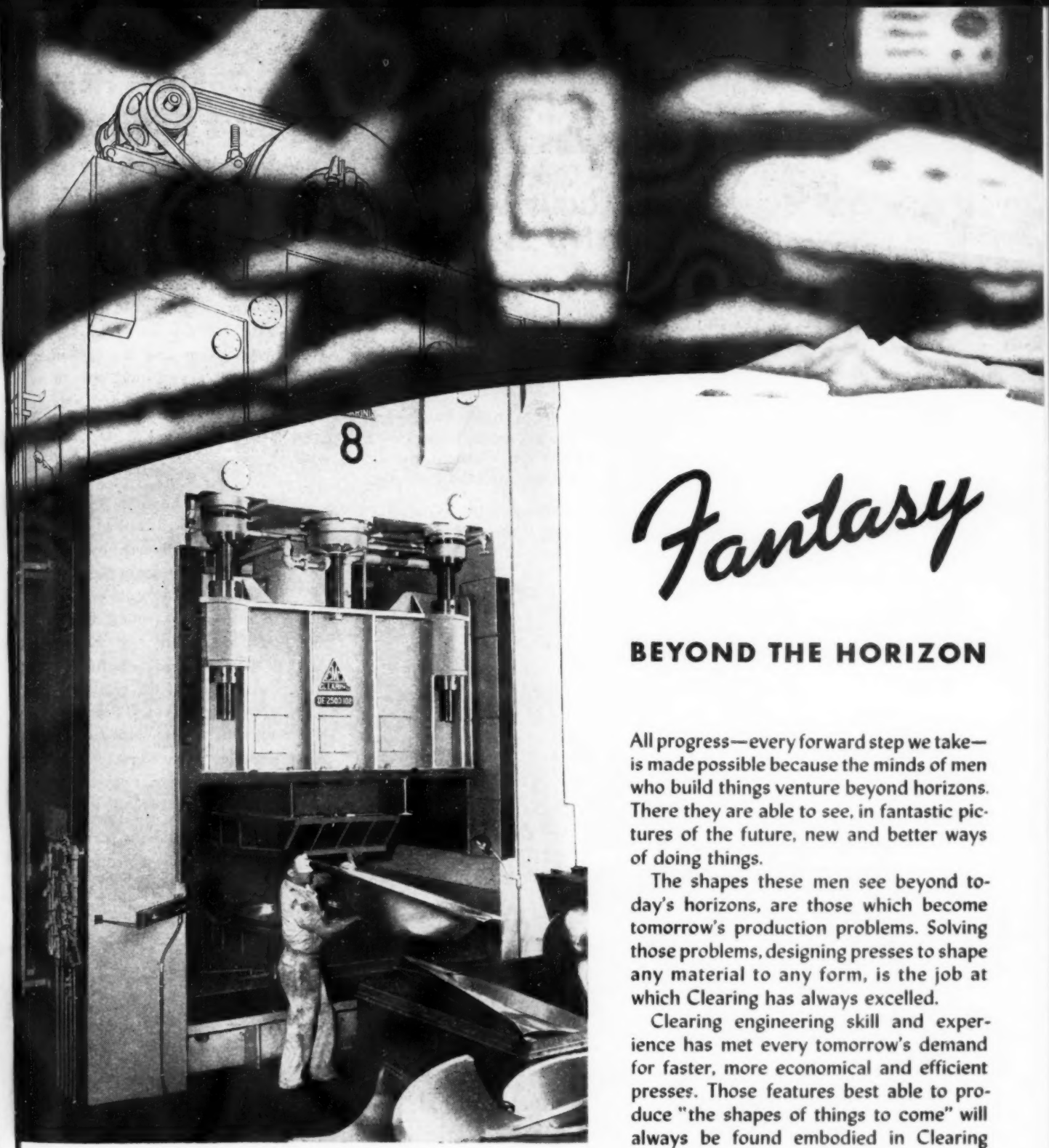
For Flanged Tapered Nose Spindles
Illustration shows chuck for Type D (Cam Lock) Spindle



FACE PLATE and BORING MILL JAWS—Steel Body Only

HORTON
MORROW

SINCE 1851 .... THE E. HORTON & SON CO.
WINDSOR LOCKS, CONNECTICUT, U. S. A.



Fantasy

BEYOND THE HORIZON

All progress—every forward step we take—is made possible because the minds of men who build things venture beyond horizons. There they are able to see, in fantastic pictures of the future, new and better ways of doing things.

The shapes these men see beyond today's horizons, are those which become tomorrow's production problems. Solving those problems, designing presses to shape any material to any form, is the job at which Clearing has always excelled.

Clearing engineering skill and experience has met every tomorrow's demand for faster, more economical and efficient presses. Those features best able to produce "the shapes of things to come" will always be found embodied in Clearing Press design.

This 500-ton capacity Clearing Mechanical Press forms uniformly accurate deep-drawn aluminum alloy parts. Throughout the aircraft industry, the unusual capabilities of Clearing Presses are being applied to solve many unusual problems.

CLEARING MACHINE CORPORATION
6499 W. 65th St., Chicago, Illinois

CMC
CLEARING

FOR SHAPES OF THINGS TO COME

CLEARING

MECHANICAL AND HYDRAULIC PRESSES

The RIGIDHOBBER

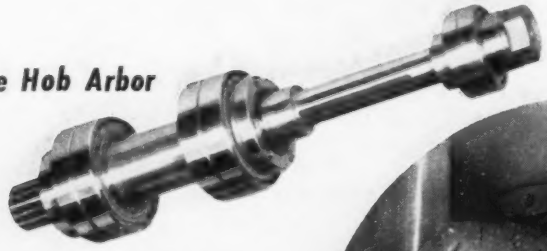
FOR SUSTAINED ACCURACY OF HOBBED GEARS AND SPLINES

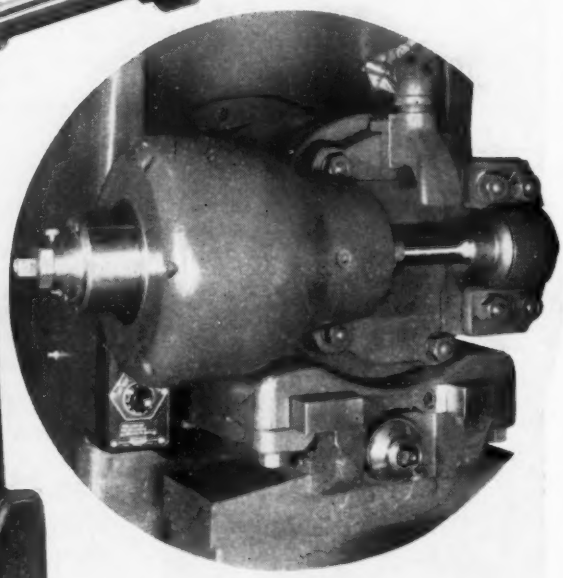
Here is one construction point of the Rigidhobber that makes for sustained accuracy in the production of hobbed gears and splines.

The Hob Arbor—
This rigidly built unit has support both in front of and in back of the hob. This support is accomplished through six rows of Balls to provide maximum rigidity. The result of this rigidity is accurate, clean, smooth finished work. It also enables the machine to maintain close tolerances on quantity production.

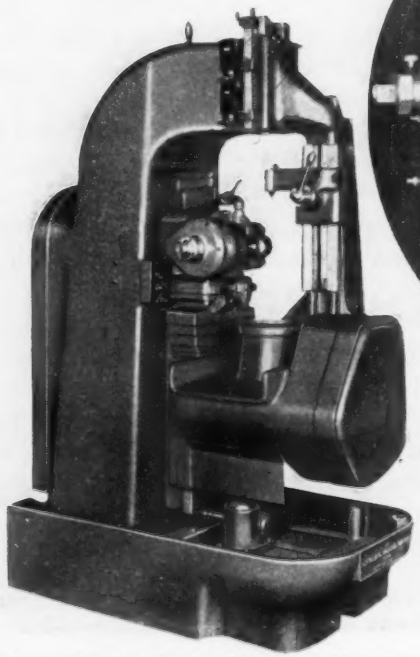
The Rigidhobber is furnished in two models—Nos. 140 and 145. Complete information upon request.

The Hob Arbor





The Hob Head



Model 140

HOBBING HELPS for Boosting War Production

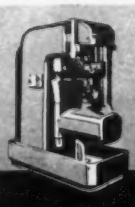
Hob Care

A hob is a precision instrument, finished to particularly close tolerances and should be handled with extreme care. Nicking the teeth means that the hob must be resharpened and a part of its life is wasted. One way to protect your hobs is to keep them in boxes and preferably over pins so that they cannot bump together.

Sharpening should be a precision operation performed to produce a smooth finish on the tooth face. After sharpening, the hob should be checked for concentricity, tooth to tooth spacing, and lead. The lead check will show if a feather edge has been thrown up on the side of the tooth by the grinding wheel. This feather edge should be avoided as it will produce inaccurately formed teeth until worn away and will cause trouble difficult to locate.

So grind your hobs correctly—take care of them properly and you will get longer service and lower cost gears and splines.

This bulletin gives specific information on the construction and operation of the Rigidhobber—tells what it can do for you and the sizes and capacities now furnished.



The CLEVELAND HOBBING
Cleveland ... MACHINE Company ... Ohio
BUILDERS OF RIGIDHOBBERS AND RIGIDTURNERS

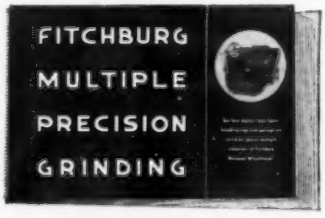
WHAT ABOUT TOMORROW'S GRINDING COSTS?

You can cut tomorrow's costs with the Fitchburg Grinders you buy today.

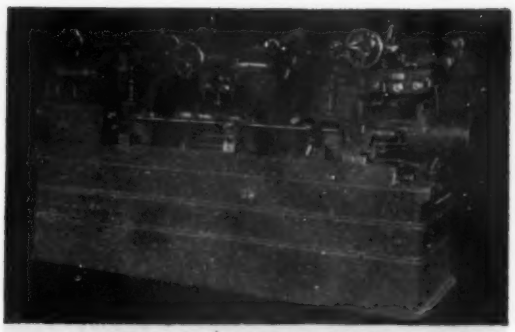
Fitchburg low cost method of mounting standard Bowgage Head Grinding Wheel Units for special single applications, or to multiple grind special jobs, will give you faster wartime production at lower cost, and leave you in a position to make rapid changeovers when the present emergency is over.

All Fitchburg Bowgage Head Automatic Precision Grinding Wheel Units are standard. They can be remounted on standard machines, or on new special bases, for operations other than the one originally specified. This feature protects your investment.

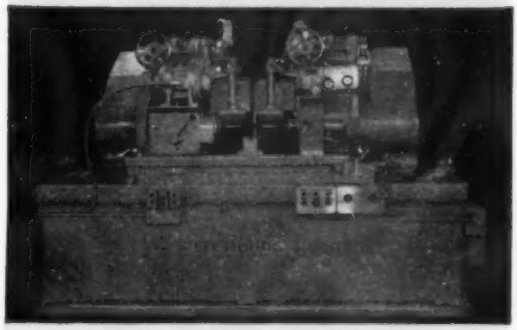
Save time and money — speed up cylindrical production grinding with Fitchburg Bowgage Heads.



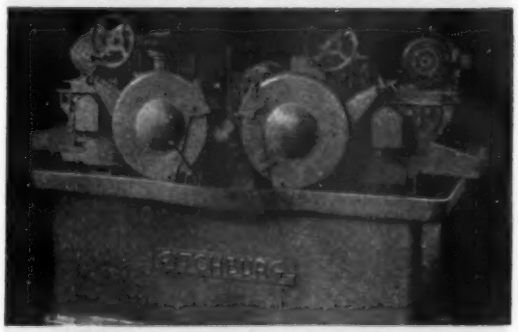
This Book shows how to cut grinding costs. . . . Free to executives. . . . Write for it today.



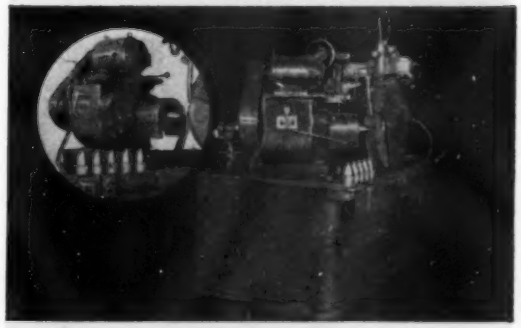
TRIPLE HEAD MACHINE



DOUBLE HEAD MACHINE



GEAR SHIFT GROOVE GRINDER



OJIVE GRINDER

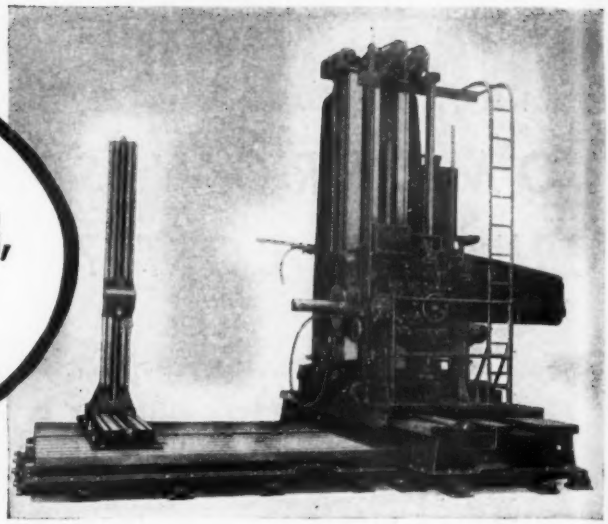
FITCHBURG GRINDING MACHINE CORP.
FITCHBURG, MASSACHUSETTS, U.S.A.
Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.

SAVE WITH AUTOMATIC MULTIPLE PRECISION GRINDING

OHIO

HORIZONTAL BORING, DRILLING, MILLING MACHINES *and* REVOLVING TABLES

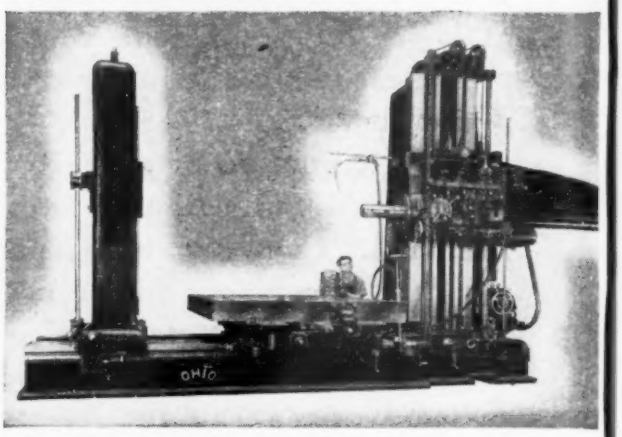
OHIO'S STEP UP PRODUCTION



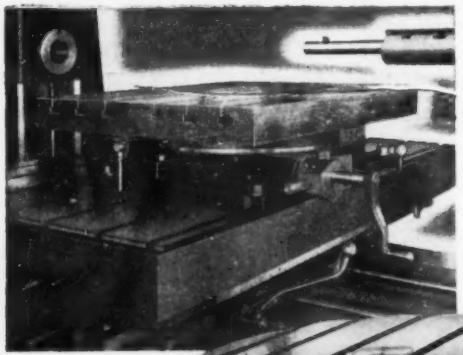
Ohio Horizontal Boring, Drilling and Milling Machines are furnished in 5" and 6" spindle sizes in both table and floor types. Extra heavy duty floor type is illustrated above.

Ohio Horizontals are built by a company which has served the metal-working industry since 1887 and which brought out the first all-anti-friction horizontal boring mill to appear in this country. Today, Ohio Horizontals are doing a notable job in production lines where high output must be combined with extreme accuracy. Ask for Bulletin 300 . . . Ohio Revolving Tables are high grade precision units graduated in half degrees. Round and square types are available from 24" through 96" in many combinations. Get our new well illustrated 12-page bulletin.

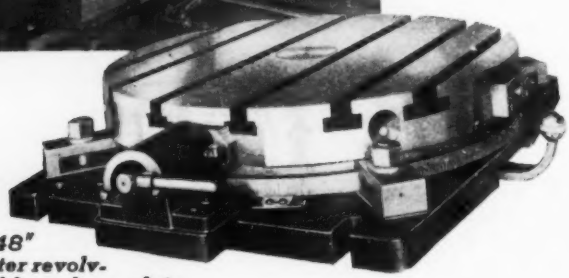
THE OHIO MACHINE TOOL COMPANY, KENTON, OHIO



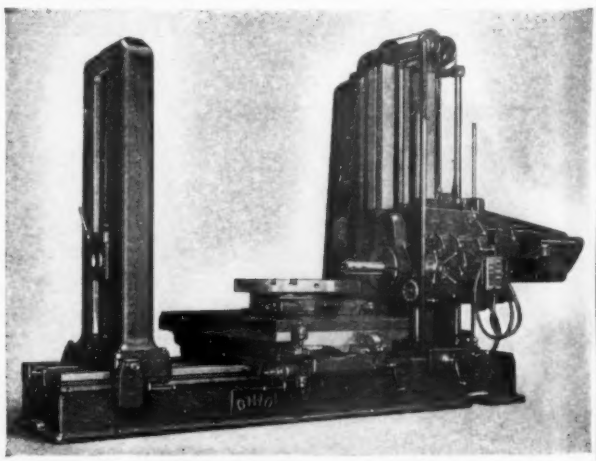
Ohio Dreadnaught extra heavy duty table type has portable control, making for quick, convenient operation. 72"x144" table. 60" wide bed.



• OHIO 48" square worm feed revolving table with anti-friction raising device and index pin and four stops.



Ohio 48" diameter revolving table on base plate with anti-friction raising device and index pin with four stops.



Extra heavy duty table type with 48"x84" table, 43" wide bed and threading attachment.

OHIO DREADNAUGHT

HORIZONTAL BORING, DRILLING AND MILLING MACHINES • SHAPERS • PLANERS

THEM!

You are looking at the Board of Directors of one of the busiest companies in the world. It is the firm of Gremlin, Widget & Finella, Inc.,* specialists in the new light-metal headaches — magnesium migraines, aluminum ailments and general alloy trouble.

As the Light Metal Age swings into mass production, this company finds itself with advance orders on hand for some of the biggest headaches in history, and already its record in the highly technical field of industrial interference is an impressive one.

One of the most notable achievements of G. W. & F. has been their handling of the weight factor in horsepower development. For years they have kept the ratio of pounds to horsepower high in all types of engines, and only the sheerest engineering genius has succeeded in producing one horsepower with slightly less than a pound of metal — yet 5 or even 10 horsepower may be possible with a pound of the right alloy.

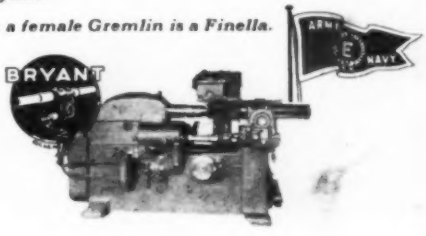
Likewise, this new subsidiary of the Headache Trust has done some pretty whimsical and spectacular things with metal, causing magnesium dust to explode, and the metal to dissolve back into sea water like so much salt. Bearings have been known to crystallize within a few hours from vibration alone, and the ideal bearing surface is one so hard that the cost of working it is still a major headache.

As specialists in internal grinding, we at Bryant have helped to cure many a new and serious headache in the working of light metals, super-hard alloys, and other new materials. We have helped to develop safer processes for machining light metals, improved methods of grinding and finishing the super-hard tungsten-content alloys, and new techniques for working such materials as hard rubber, glass, graphite, plastics, bronze and cast iron, as well as centrifugally cast steels and alloys from hundreds of new specifications.

If your business calls for the use of precision machine tools, Bryant's Consulting Service can be of greater value to you today than ever before. We urge you to "Send for the man from Bryant!"

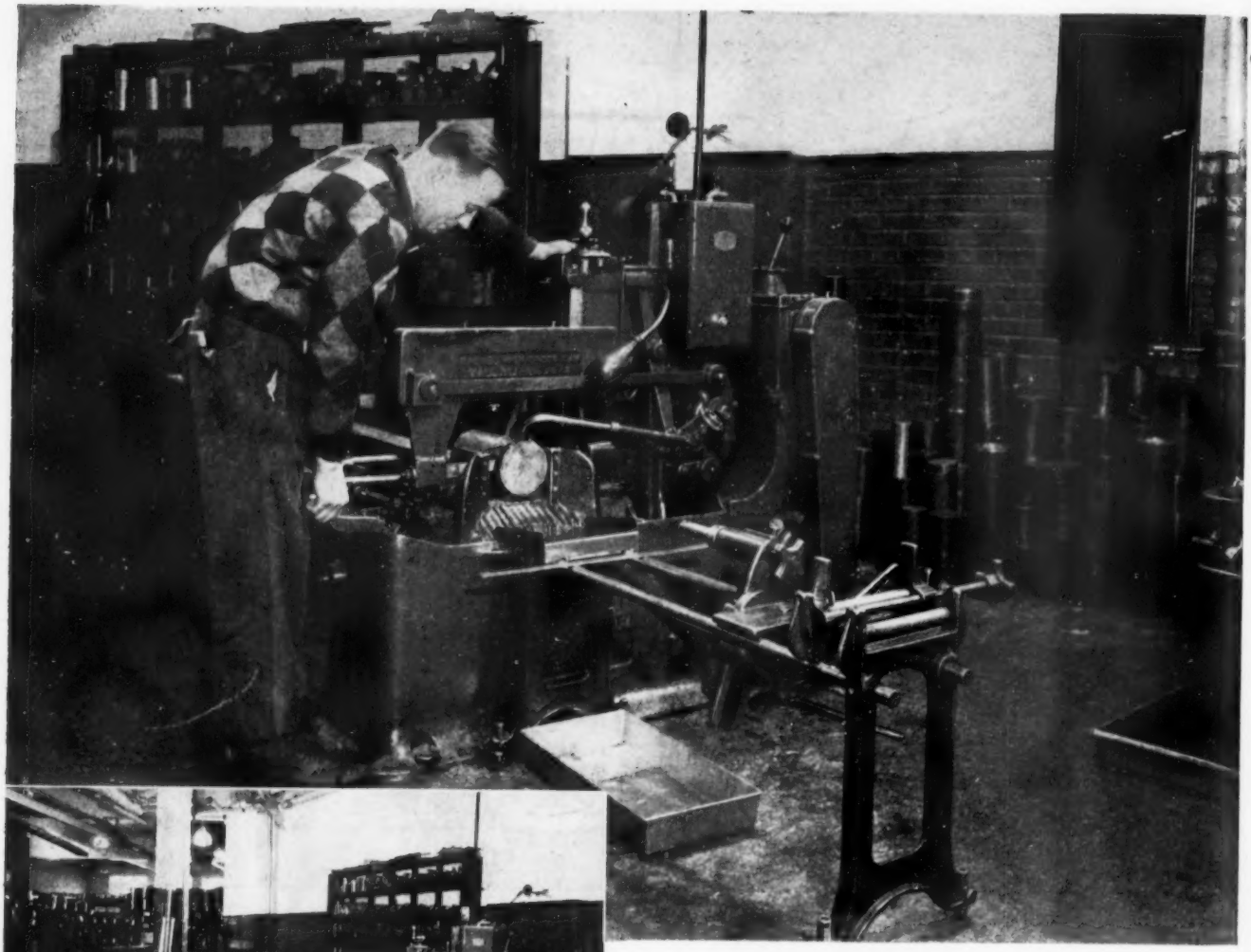
Subsidiary of the Gremlin Headache Trust. A Widget is a young Gremlin; a female Gremlin is a Finella.

SEND FOR THE MAN FROM BRYANT

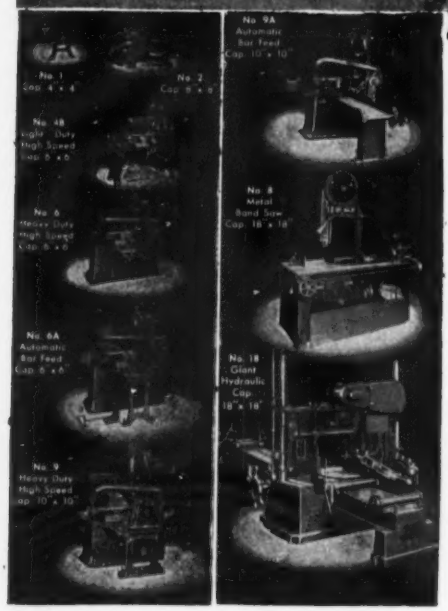


Bryant Chucking Grinder Co.

Springfield, Vermont, U. S. A.



MARVEL SAWS



Cutting-off continuously at high speed at Wright Aeronautical Corporation.

Since the start of the National Defense Drive, and now under war production, these MARVEL PRODUCTION SAWS at the Wright Aeronautical Corporation, Paterson, N. J., have operated continuously; have been cutting-off "round and square stock, all kinds of alloy steel up to 10" D., and 10" Sq. and giving A-1 satisfaction."

When photographed, the MARVEL 9A was cutting-off S.A.E. 3140 Steel Tubing, 3⅛" O.D. x 1⅞" I.D. at the rate of a piece every minute and a half, while the MARVEL 6A was cutting a slice from a 5½" D. Cold Rolled Steel bar every six minutes. These heavy duty all ball-bearing saws with automatic bar push-up, will cut-off more pieces, floor-to-floor, than any other hack sawing machine.

ARMSTRONG-BLUM MANUFACTURING COMPANY

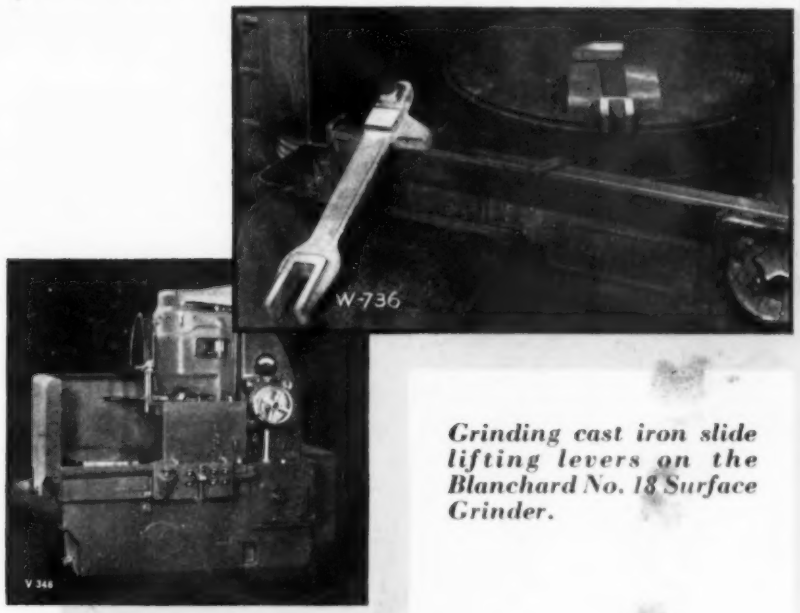
"The Hack Saw People"

5700 Bloomingdale Ave. Chicago, U. S. A.

Eastern Sales Office: 225 Lafayette St., New York

BLANCHARD

"PUT IT ON THE BLANCHARD"



Grinding cast iron slide lifting levers on the Blanchard No. 18 Surface Grinder.

CHECK THESE ADVANTAGES OF BLANCHARD GRINDING

- **Production**
- ★ **Adaptability**
- ★ **Fixture Saving**
- **Operation Saving**
- **Material Saving**
- **Fine Finish**
- **Flatness**
- **Close Limits**

★ . . . . . *Especially valuable on jobs like the one illustrated.*

AT FIRST GLANCE this does not look like a job for the Blanchard No. 18 on account of the projecting boss. The problem was solved simply enough. The lever is laid on the chuck so that the boss goes through the hole in the center of the chuck. The outer surface, which is lower than the inner surface, is ground. The wheel is then raised, the chuck moved in, and the inner surface is ground. The lever is then turned over and a .290″ size block is placed under the ground forked end to make it level with the other end, and both surfaces are finished.

3/16″ of stock is ground off each side to limits of +.002″. 8 pieces (16 surfaces) are ground per hour.

The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE, MASS.

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

DIVING SPEEDS require *Extra Safety*

. . . as with MICROHONING

When *diving motors* "rev" up to 5600 r.p.m., the entire success of a mission may depend upon having an extra margin of safety in critical bearing surfaces. These surfaces are not completely safe unless extremely accurate, and "structurally perfect"—entirely free of microscopic cracks and disturbed subsurface material which induce fatigue failure.

MICROFINISH HONING is providing such surface quality in regular high production because—

It does not generate injurious frictional heat—hence avoids cracks.

It does not disturb or weaken subsurface material.

It corrects error and generates accuracy.

It generates any desired type or degree of controlled surface finish smoothness.

It provides all these advantages under the control of a single process.

Micromatic
HONE CORPORATION
DETROIT, MICHIGAN
Manufacturers of Honing Machine Tools

MICROHONING
is used to finish

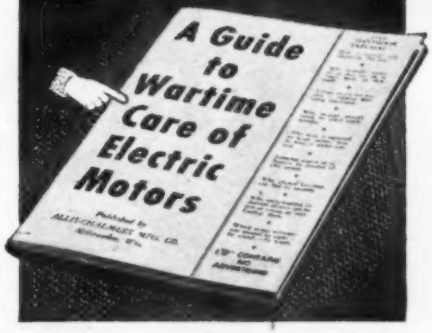
Gun Barrels—before and after rifling—diameters .303" to 18" and lengths up to 75 feet • Gun Recuperators and Engine Cylinders • Wrist Pins • Valve Guides • Con Rods • Bearings • Pneumatic and Hydraulic Cylinders—and many other precision parts for ordnance, aircraft, automotive equipment, tanks, machine tools, etc.

Phone
DETROIT
TRINITY
1-1300

Some Job to Keep Motors Rolling at This Rate!

'ROUND THE WORLD EVERY 8 DAYS — That's the rim travel of a rotor in many electric motors working on the new 24-hour-a-day, 7-day-a-week "suicide schedule"!

Now that U. S. motors are working up to 3 and 4 times as many hours a year as in peacetime, they need wartime care! Send in to Allis-Chalmers for your free copy of "A Guide to Wartime Care of Electric Motors." It's packed with the new data you need today!



HERE ARE THREE OF A MOTOR'S MOST DANGEROUS ENEMIES . . .

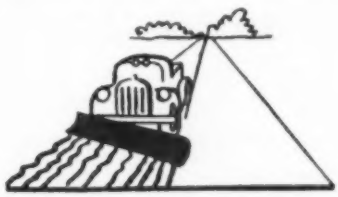
1. Overload—Now that motor overrating is U.S. policy, a closer eye than ever

must be kept on a motor's overload protection. Like an overloaded horse, a motor worked too far beyond its horsepower capacity is sure to break down. See page 16 of "A Guide to Wartime Care of Electric Motors" for helpful tips. Already, wartime industry is using over 80,000 copies of it!

2. Friction—Standard peacetime instructions for guarding motors against friction were based on 8-hour-a-day, 7-day-a-week operation. Those instructions are dangerously obsolete today! All your maintenance men

should read the articles on "Dust" and "Friction" in Allis-Chalmers' new motor maintenance guide. It's profusely illustrated (with easy-to-understand sketches like these above).

3. Uneven Wear— Just as "rutting" is fought in road maintenance, "grooving" must be fought in *motor* maintenance. For on commutators and slip rings, smooth and even wear is *slow* wear. Every man in your maintenance department should know "A Guide to Wartime Care of Electric Motors" forward and backward. Send in today for *your* free copy to ALLIS-CHALMERS MFG. Co., Milwaukee, Wis.



ALLIS-CHALMERS

WE WORK FOR VICTORY — WE PLAN FOR PEACE

A 1590

SUNICUT

"Increases tool life . . . saves time and labor"

Production of vital parts for tanks, tractors and "blitz buggies" was hampered at this large automotive parts plant by poor tool life. Scarcity of small tools added to the seriousness of the problem.

Then a Doctor of Industry—a Sun Cutting Oil Engineer skilled in metal working problems—was called. He studied the conditions and prescribed a change in cutting oil—to Sunicut, the transparent, sulphurized cutting oil. Sunicut proved to be the right answer. The life of valuable small tools was prolonged by 70% . . . fewer "down times" for tool changes were required . . . production was speeded along the line.

War plants of all kinds—with a variety of cutting oil problems—are finding Sunicut's superior metal-wetting and heat-absorbing properties the answer to their metal working problem. Call in a Sun Doctor of Industry today to study your particular operating conditions . . . and recommend the correct grade of Sunicut to increase tool life and boost production in your plant. Write

SUN OIL COMPANY · ***Philadelphia***

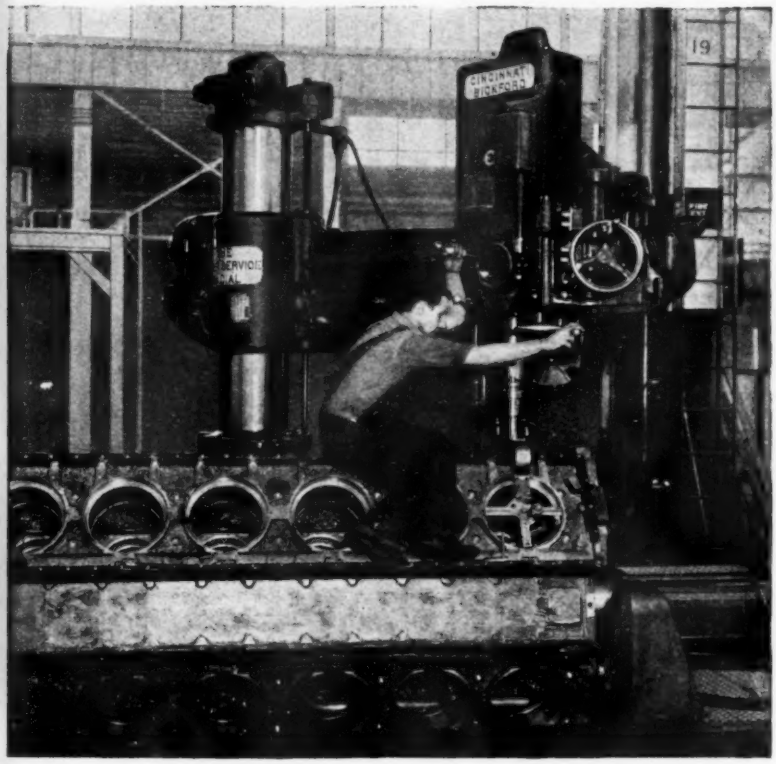
Sun Oil Company, Ltd., Canada

SUNOCO

UN PETROLEUM PRODUCTS *HELPING INDUSTRY HELP AMER*

BUILDING DIESELS *FASTER*

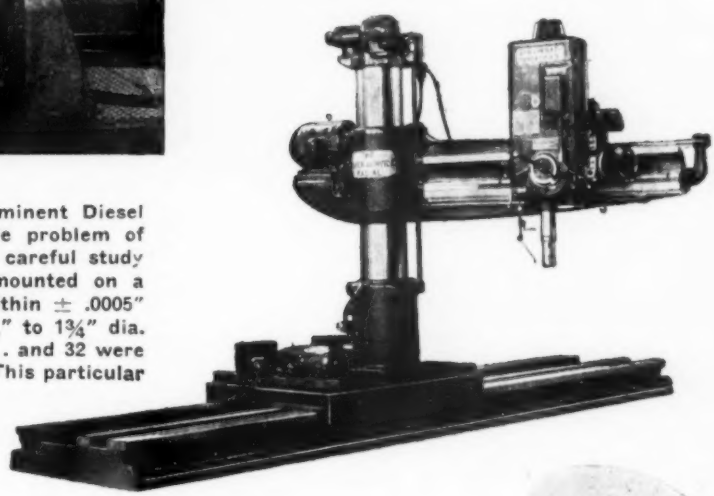
for the RAILROAD *to* VICTORY

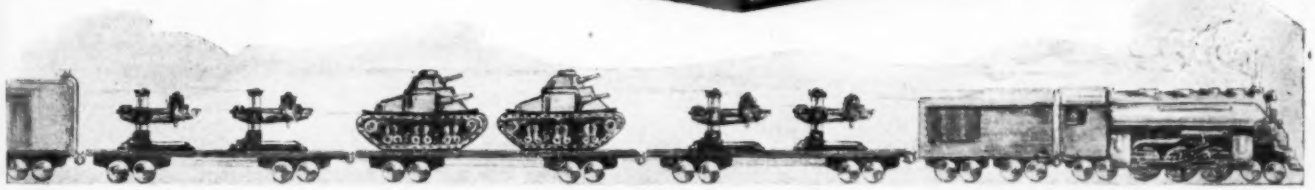


ABOVE: This machine is in continuous use by a prominent Diesel Engine manufacturer. They were confronted with the problem of drilling operations in their 5600 lb. crank cases. After careful study they chose the SUPER SERVICE RADIAL DRILL, mounted on a sliding base, to facilitate over 1200 operations, some within ± .0005" center-line to center-line . . . 611 holes ranging from ¼" to 1¾" dia. were drilled . . . 487 were tapped . . . 72 were reamed . . . and 32 were counterbored . . . with a floor-to-floor time of 24 hours. This particular type of machine was selected due to its extreme versatility of not only its head, arm and column, but also its base construction.

SUPER C B SERVICE

BELOW: Super Service Radial Drill equipped with sliding base and bed allowing 15' traverse. Ends of bed are machined for adding thereto, and bedways are automatically oiled by forced feed lubrication. Power traverse and electric clamping of the sliding base are push-button controlled at the head where all controls are conveniently grouped.

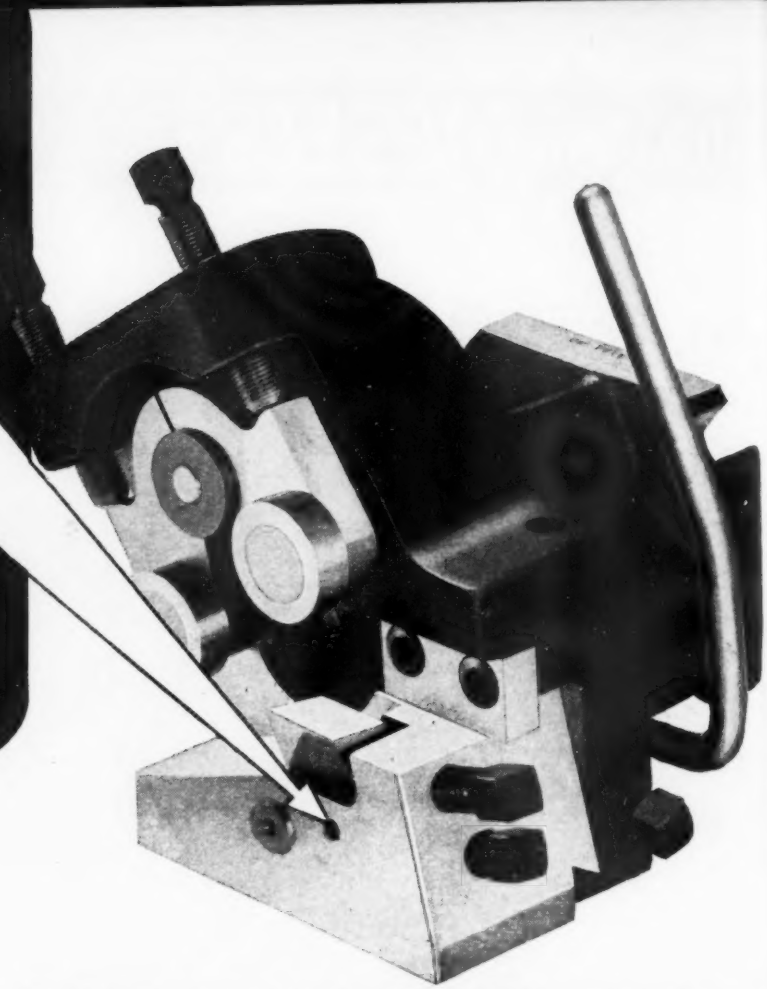




THE CINCINNATI BICKFORD TOOL CO.

OAKLEY · CINCINNATI · OHIO · U. S. A.

"BROTHER, THAT HOLE ISN'T THERE JUST FOR DECORATION!"



FIELD STUDIES in scores of plants have shown an urgent need for a more thorough understanding of the Single Cutter Bar Turner. For example, we found operators—experienced operators—having difficulty in positioning cutters of varying thickness in the cutter slot. The remedy is simple—a hollow set screw wrench used through the hole in the front of the block permits easy adjustment of a screw for backing up the cutter.

KNOW THE FULL POSSIBILITIES OF THIS BASIC TOOL IN BAR TURNING

THE Warner & Swasey Single Cutter Bar Turner is used more than any other tool in turret lathe setup for bar work. It is designed and built to hold close limits and deliver fine finishes under fast production. When undersized or oversized diameters occur or "barber-pole" finishes appear, invariably they can be corrected by an operator who knows how to adjust and use the tool.

To give operators a thorough knowledge of a tool they use most often and to provide definite helpful hints that will result in better bar performance, we have compiled a 32-page booklet, full of illustrations and diagrams. It will be sent on request.

New Single Cutter Bar Turner Manual Points Many Ways to Increased Production

WARNER & SWASEY
Turret Lathes
Cleveland

TO GET YOUR COPY, MAIL COUPON **NOW**

Warner & Swasey Operator's Service Bureau, Cleveland, Ohio
Please send booklet, "Better Performance from Single Cutter Bar Turners".

Name _____

Address _____

City _____ State _____

I work at (Company) _____

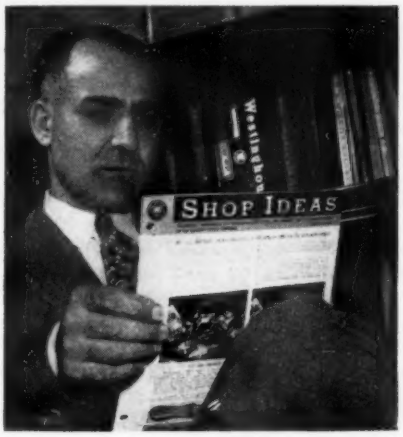
AM-12

YOU CAN TURN IT BETTER, FASTER, FOR LESS . . . WITH A WARNER & SWASEY

WHAT'S IN THIS ISSUE

TAILORED AT TUCSON

Modification, a unique development in one aircraft industry, prepares planes for the climatic conditions of special theaters of war and puts the latest design improvements into effect weeks before they can be incorporated in regular production. Modification centers face such a rapidly shifting variety of problems that their methods are improvised on the spot. Typical is Consolidated-Vultee's modification center, in the Arizona desert, near Tucson, where Liberator (B24) bombers are tailored. Page 75.



J. Manuele

PREVENTION VS. REJECTION

By charting the tendencies of deviation, quality control makes it possible to predict an impending rejection before any pieces are spoiled. With this information it is possible to correct maladjustments before defective parts are produced, rather than to rely on the screening operation of the ordinary system of inspection. Using such a plan, Westinghouse Electric & Manufacturing Company has increased production as much as 30 percent, while decreasing unit cost. J. Manuele, director of quality control in that company's East Pittsburgh plant, describes the system. Page 78.

TOO MUCH TEACHING

Believing too much teaching retards women trainees, even as too much food slows athletes, Lodge & Shipley Tool Company pared its training program to bare essentials. The result: a 24-hour course during which they learn to use basic tools and instruments, to read decimal charts and mechanical drawings and generally gain a basic concept of shop work. Scientific tests determine each trainee's suitability for the course; examinations at the end of each step indicate whether or not she is ready for the next; shop tours and safety training rub off some of the "greenness." In a highly readable article by Richard S. Schultz and Thomas Applegate, Lodge & Shipley's streamlined system is described. Page 82.

Richard S. Schultz

Thomas Applegate

PLANES FROM THE PLAINS

Out in the wide-open spaces, where men are becoming mechanics and the women are putting aside frocks for overalls, immense factories have sprung up on the broad Texas plains. With typical western breeziness, employees of new North American Aviation plants there have revised methods for greater production. Several of their improvements are pictured and described. Page 92.

FOUND AT DUNKIRK

One of the important things the retreating British brought back with them from Dunkirk was a healthy respect for the effectiveness of the Bofors 40-mm. gun against low-flying aircraft. The U. S. armed services learned of the part this weapon had played in making possible the success of that historic retreat, secured blueprints and contracted with the Chrysler Corporation to redraw them to American standards and produce two sample guns. Since the gun was originally designed for production in European toolrooms or gun shops of limited scope, Chrysler had to redraw plans to make it possible to meet high output quotas, while overcoming the scarcity of labor, materials and machine tools. In the two years ensuing, parts have been drawn and redrawn many times, some manufacturing tolerances have been tightened to insure interchangeability, and the great majority of handfitting has been eliminated.

Chrysler Corporation has many thousands of men and machines devoted to the production of the Bofors 40-mm. anti-aircraft cannon. The story is given in detail in the Armament Section, Page 97.

METAL-CLEANING SERIES

Cleanliness is a "must" for satisfactory finishing of metals. To aid the production engineer faced with the problem of selecting proper methods and materials, there will be published, beginning with this issue, a series of articles devoted to the cleaning of metals in a modern high-production shop. Dr. R. W. Mitchell, technical director, and Marcel T. Zinty, chief engineer, Machine Division, Magnus Chemical Company, write of the best means of handling cleaning jobs. Page 86.

Dr. R. W. Mitchell

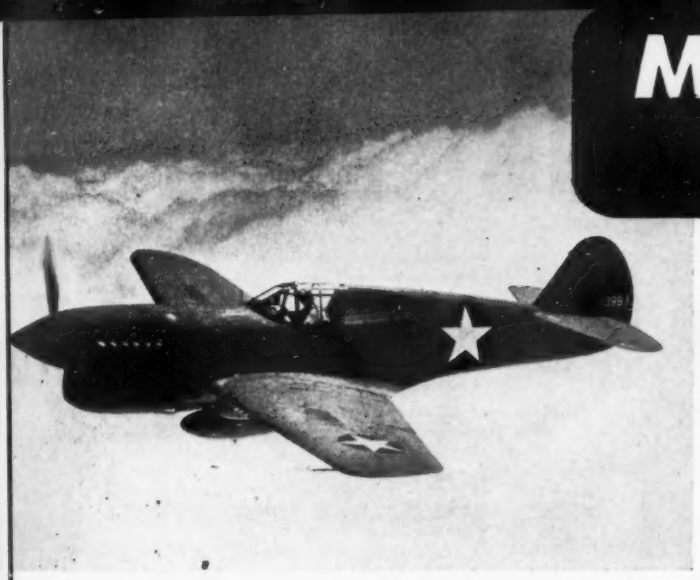
Marcel T. Zinty

COMING

How should an aircraft assembly fixture be designed? A lot of articles have explained particular applications of such fixtures, but little has appeared on the principles behind them. As a matter of fact, aircraft fixture tooling has only recently graduated from the rule-of-thumb stage.

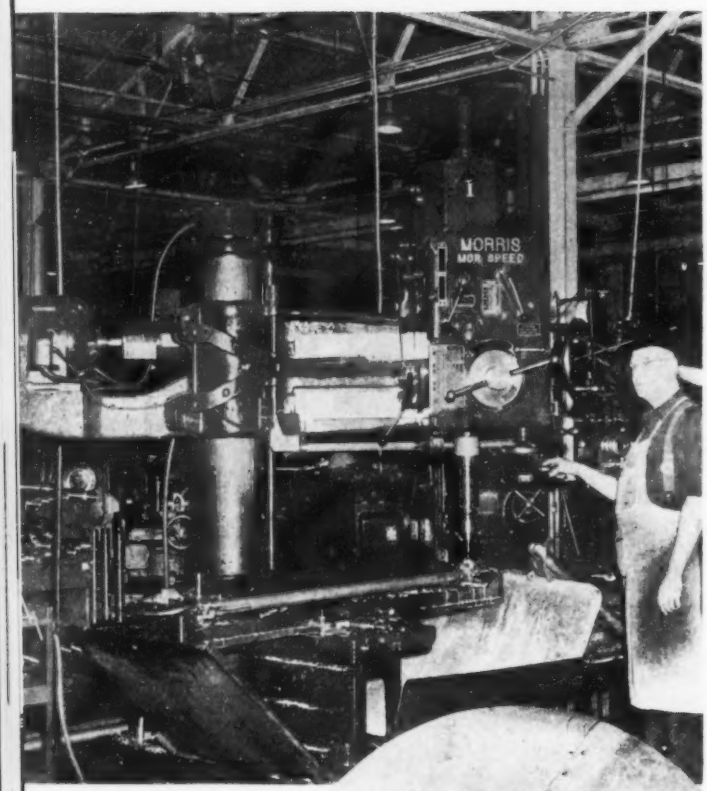
In order to present to our readers some up-to-the-minute information on this phase of tool engineering, we have visited leading aircraft manufacturers and talked to their tool designers. One thing we found was a healthy difference of opinion; but the findings were mighty interesting. The result is a number of articles on the subject. The first, describing the methods used by North American Aviation, in its Dallas Division, will appear soon.

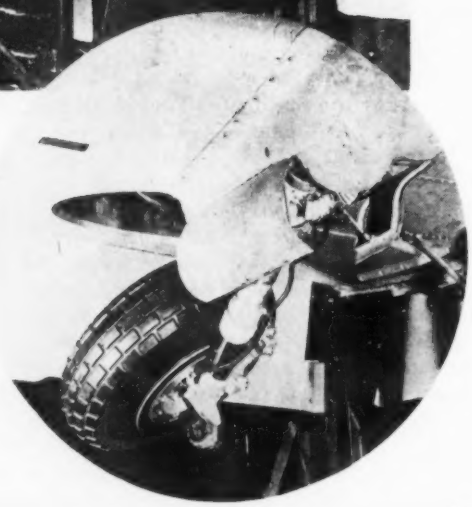
MORE PLANES *Coming up!*



VIA

MORRIS MOR-SPEED RADIALS





Illustrating the collapsing landing gear of a Curtiss P-40 as it drops for a landing.

• The major objective of the prominent aircraft plant, where this Morris Mor-Speed is operating, is to keep more planes coming up for our forces all around the globe.

The Morris Mor-Speed Radial illustrated is drilling a part for the landing gear assembly. Morris Radial speed, accuracy and ability to produce accurately on triple shift operation are helping this company to produce more planes in less time. In short, to keep more planes coming up.

No matter what your job is, whether for airplane, tank, cannon or small arms production, if it calls for a Radial—put it on a Morris Mor-Speed for greater production, closer accuracy and lower costs.

PRATT & WHITNEY

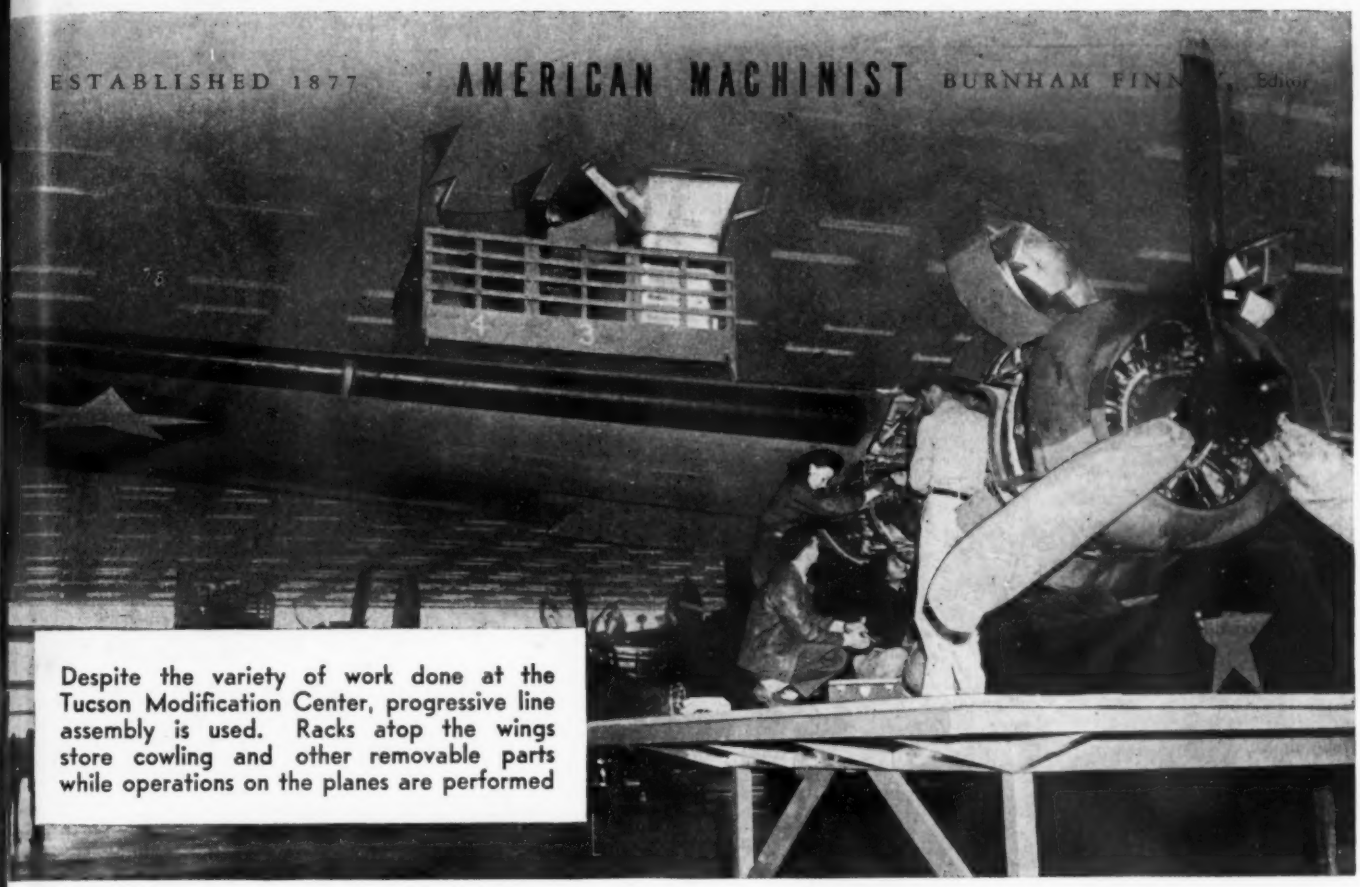
Exclusive Sales Agents for the United States

Builders of MOR-SPEED Radials

The MORRIS Machine Tool Co.

CINCINNATI, OHIO

ESTABLISHED 1877 AMERICAN MACHINIST BURNHAM FINN[illegible], Editor



Despite the variety of work done at the Tucson Modification Center, progressive line assembly is used. Racks atop the wings store cowling and other removable parts while operations on the planes are performed

TOMORROW'S PLANES TODAY

Keeping the design of our warplanes a jump ahead of production lines is the job of a number of modification centers carefully distributed over the United States. Standard fighting ships are prepared for action on special fronts and the latest refinements, fresh from the designer's drawing board, are incorporated before assembly lines can be switched over. Here's how Consolidated-Vultee does it at Tucson

MODIFICATION, a recent development in aircraft manufacture, has become a business in itself. Its purpose is to relieve high production plants of "tailoring" jobs—special work that would otherwise interrupt the smooth flow of new ships through established assembly lines.

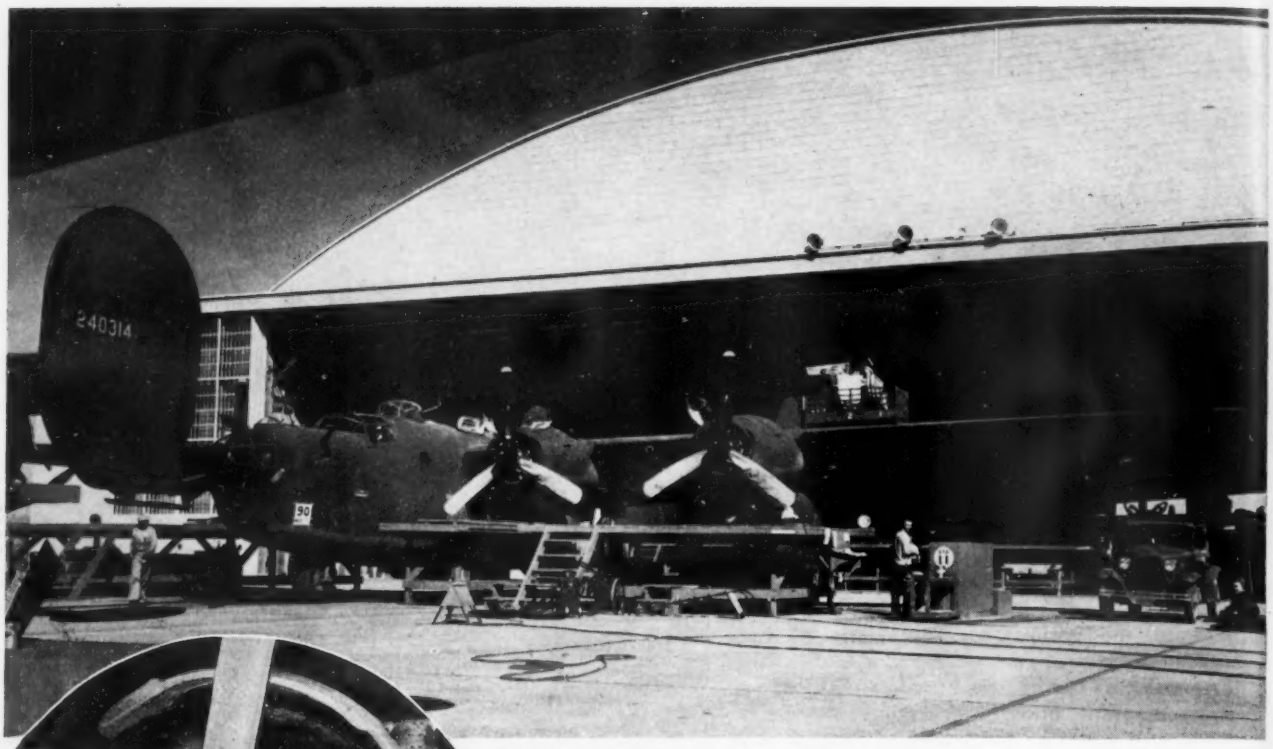
Recognition of the usefulness of this activity resulted in the establishment of separate modification centers. An outstanding example is the Tucson Division of the Consolidated-Vultee Aircraft Corporation which is devoted entirely to tailoring the Liberator (B-24) heavy bomber for combat.

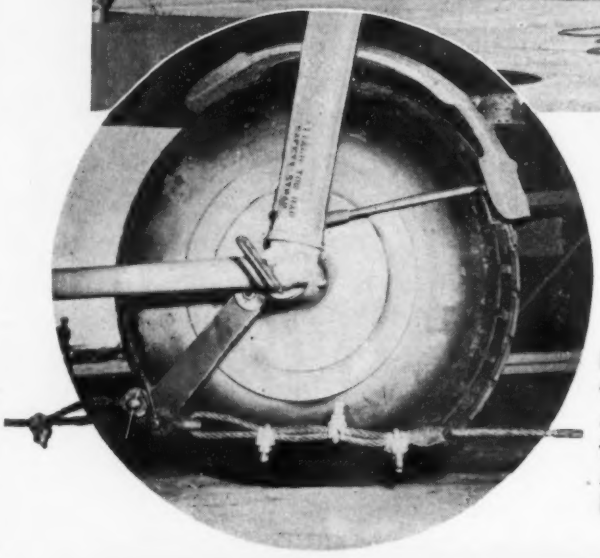
Modification is of two kinds:

1. Work required to equip fighting ships for specific service—winterizing for cold weather operation; protection against the sand and heat of the desert or the tropical humidity of the jungle; or any design alterations specified by the Army Air Force Special Projects Branch, at Wright Field, to make fighting ships more effective for particular theaters of war. Such changes are permanent modification center work; at Tucson they comprise about 25 percent of the plant's activities.

2. Basic design changes which have not yet been incorporated in the production lines of the parent plant. Such work is temporary for the modification center and is transferred as soon as possible to the parent plant. The function of this type of modification is to put new ideas into effect immediately—to build tomorrow's planes today. Usually the modification center performs such work from three to nine weeks before it is made part of the initial manufacture of the plane. The Consolidated Tucson Division devotes about 75 percent of its energies to such temporary modification.

Since this work changes from month to month, the modification center cannot indulge in elaborate tooling. It is essentially a job shop in which methods are improvised as the need for them arises. Such work calls for a high degree of ingenuity which would ordinarily call for the services of all-around craftsmen. Actually only a handful of the center's employees can be classed as





Not all of the work stations are under cover. Tucson's sunny climate makes outdoor work stations practical. Planes leaving the center are ready for combat

Planes are towed from station to station by means of cables attached to special links on the forward landing gear hub. A tractor at the head of the line pulls the entire row at scheduled intervals

Sheet-metal parts are fabricated, using shears and tin snips. Whenever possible, simple bends are used in preference to drawn shapes

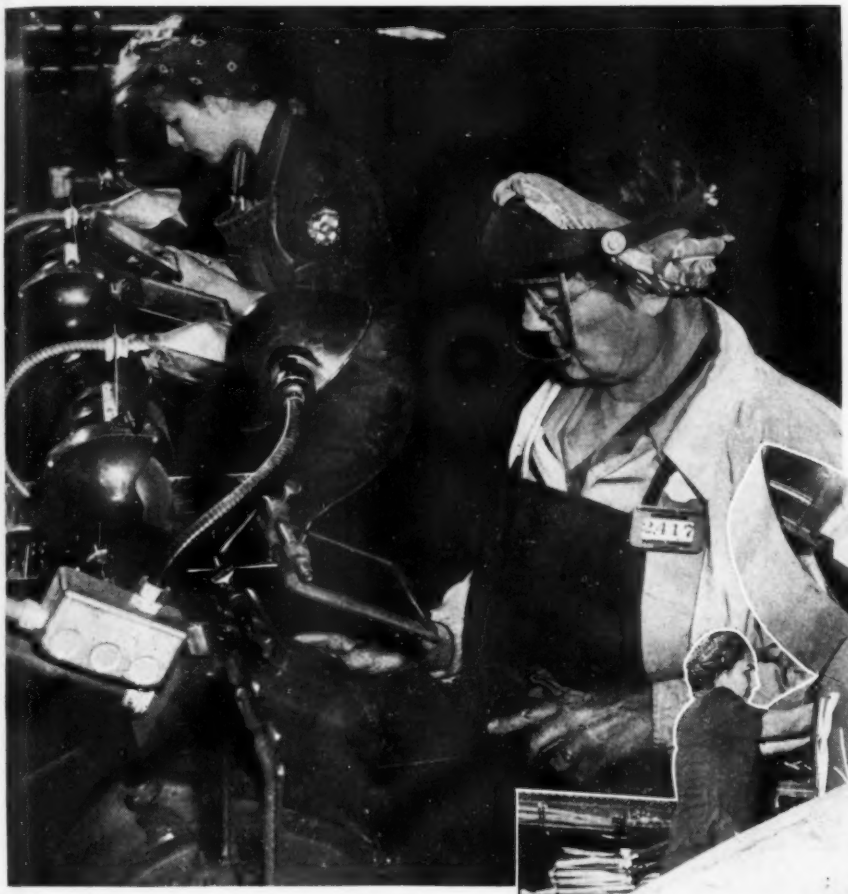
skilled. The rest, recruited from nearby communities, are ex-ranch hands, clerks, sailors and housewives. A training program has developed a high degree of adaptability in these employees despite their newness to industry.

General-purpose machine tools, such as engine lathes, bench lathes, grinders and drill presses are used to meet the varying character of the work. Sheet metal is cut on shears or with tin snips and formed over maple blocks to secure the desired contours.

Since the center is called upon to do unusual and unexpected jobs, "quick and dirty" tooling is the rule rather than the exception. Supervisors must be on their toes to turn out work for which no provision has been made. Often methods abandoned years ago by production plants are resorted to in order to get the job out on time.

Despite the unpredictable nature of the work, ships are moved along a progressive assembly line on their own landing gear wheels through twelve work stations, some of which are out of doors. The planes are hitched together by means of steel cables and towed by a tractor attached to the end of the line.

Planes are flown into the modification center and away from it when work is completed. They leave ready for combat, incorporating the latest experience from the fighting fronts. Thus, modification keeps United Nations' fighting ships one jump ahead of the enemy.



Winterizing, or other adaption for particular theaters of war is the Center's steady job. Putting design changes into effect ahead of the parent company forms a series of temporary jobs

Women have been trained for work at the Tucson Modification Center although little of the work is repetitive. They perform both machine tool and assembly jobs

Each tube is bent to a sample on equipment built at the modification center, using standard Parker bending heads

Quality Control Will Reduce Costs

BY J. MANUELE, WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY

Rejections can be held to a minimum by inspecting the parts during early production stages. Errors in dimensions can then be averaged and tool set-ups or designs changed accordingly

AN INCREASE in production of as much as 30 percent and a corresponding decrease in unit costs, without the addition of machine tool equipment or other manufacturing facilities, have resulted from the application of quality control to manufacturing operations at Westinghouse. The increased production and lower cost have been obtained merely by an improvement in the quality of the product. The improved tooling and machine set-ups required to achieve the better quality have also resulted in further increased production.

Quality control complements the usual inspection procedure and focuses attention during early production stages on conditions that cause defective work. It puts inspection closer to the beginning of the manufacturing cycle and determines:

1. Will defective parts be produced by this set-up and tooling?
2. What is the cause for the production of these defective parts?

There are three general methods in quality control, each of which has its particular application to insure the production of parts acceptable in every respect:

1. Statistical analysis to answer the question: "Can it be made?" This is followed generally by the application of either of the following two methods.
2. Control chart method, which is applied generally to continuous operations and on parts which have to be made to extremely close tolerances.
3. First-piece and patrol inspection, which has wide application and can be used on both tooled and hand operations.

A good application of statistical analysis is the molded part shown in Fig. 2. This part is made in a 16-cavity mold and considerable difficulty was being experienced in maintaining the

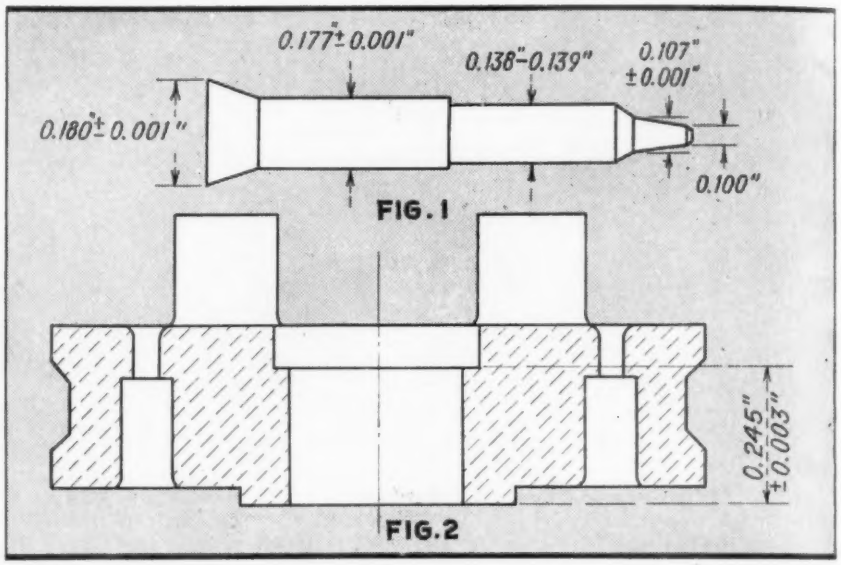


Fig. 1—Under normal methods it costs more to inspect this screw-machine part than it does to make it. Before quality control was adopted, rejections averaged 22.3 percent. Quality control reduced rejections to less than 1 per cent. **Fig. 2**—The critical dimension on this molded part is 0.245±0.003 in. Quality control is maintained by running a number of parts, averaging the dimensions for parts from each cavity, and changing the cavity to produce a part of greater accuracy

0.245 ± 0.003 in. dimensions. Therefore, the first step was to determine whether the part could be made.

Thirty-three pieces were taken from each cavity and carefully measured. From these measurements the average X of the pieces produced by each cavity was calculated. The standard deviations δ was also calculated. These two statistics are shown in Table 1.

Remembering that according to the normal curve 99.7 percent of the parts will be produced within the limits $X \pm 3\delta$, we find that the parts are being produced within the proper tolerances, (3δ is smaller than 0.003 in. for each of the 16 cavities), but X is too far from the nominal dimensions of

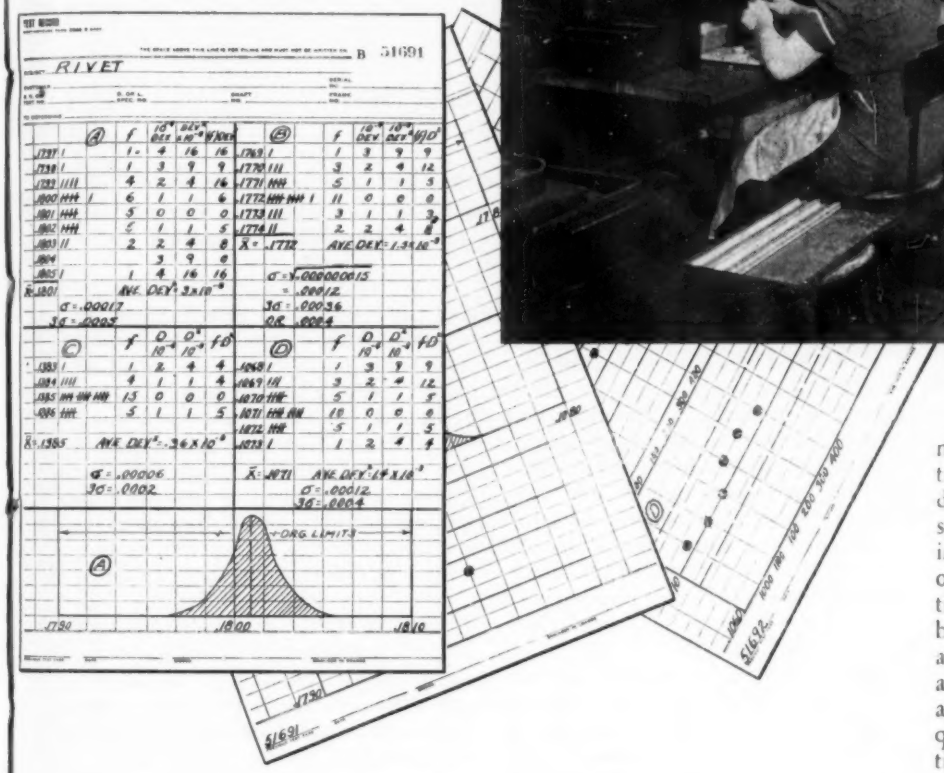
TABLE 1—Deviation in Parts Before Cavity Correction

	No. 1	*No. 2*	*No. 3*	*No. 4*	*No. 5*	*No. 6*	*No. 7*	*No. 8*
X	0.2471	0.2535	0.2579	0.2573	0.2559	0.2599	0.2576	0.2542
δ	0.0009	0.0009	0.0010	0.0006	0.0008	0.0007	0.0005	0.0006
3δ	0.0027	0.0027	0.0030	0.0018	0.0024	0.0021	0.0015	0.0018
	No. 9	*No. 10*	*No. 11*	*No. 12*	*No. 13*	*No. 14*	*No. 15*	*No. 16*
X	0.2484	0.2513	0.2589	0.2510	0.2572	0.2532	0.2558	0.2571
δ	0.0008	0.0005	0.0010	0.0005	0.0007	0.0007	0.0008	0.0007
3δ	0.0024	0.0015	0.0030	0.0015	0.0021	0.0021	0.0024	0.0021

NOTE: Thirty-three pieces were taken from each of 16 cavities and measured. The average of the measurements are shown here as X, while δ is the deviation calculated from the standard dimension.

Each inspection tag must be displayed prominently at the machines. The inspector has authority to shut down any operation on which the tag is not shown

Fig. 3 *(below)*—This typical control chart for the part in Fig. 1 shows the long machine run obtainable when cutting tools are properly dressed and tool set-ups are correct



0.245 in. in every one of the 16 cavities. This means that the part can be made within the tolerances required, but the individual mold cavities must be adjusted to bring the average of each cavity to 0.245 in.; cavity No. 1 will have to be closed (0.2471 — 0.2450) 0.0021 in., cavity No. 2 will have to be closed (0.2535 — 0.2450) 0.0085 in., and so on.

Table 2 shows the average and standard deviation for 50 pieces produced in each of the 16 cavities after the mold was corrected. This reveals that the operation should produce parts which are all satisfactory. A detail inspection of 1,000 parts revealed no rejections. An inspection of 10 percent of a subsequent lot of 6,000 parts also failed to reveal any defective units.

TABLE 2—Deviation in Parts After Cavity Correction

	No. 1	*No. 2*	*No. 3*	*No. 4*	*No. 5*	*No. 6*	*No. 7*	*No. 8*
X	0.2444	0.2446	0.2442	0.2460	0.2454	0.2461	0.2444	0.2442
δ	0.0006	0.0005	0.0009	0.0009	0.0008	0.0008	0.0009	0.0007
3δ	0.0018	0.0015	0.0027	0.0027	0.0024	0.0024	0.0027	0.0021
	No. 9	*No. 10*	*No. 11*	*No. 12*	*No. 13*	*No. 14*	*No. 15*	*No. 16*
X	0.2444	0.2432	0.2436	0.2458	0.2441	0.2445	0.2453	0.2450
δ	0.0009	0.0006	0.0008	0.0008	0.0007	0.0007	0.0007	0.0006
3δ	0.0027	0.0018	0.0024	0.0018	0.0021	0.0021	0.0021	0.0018

As a result of this investigation and mold correction a counterboring operation was eliminated, thus materially reducing the cost of the part. Detail inspection of all parts was also eliminated, thus materially reducing the cost of inspection. Also, the full productive capacity of the operation is now being utilized since all parts produced are acceptable. From this point on only an occasional floor inspection, to guard against mold wear, is all that is required to insure the continued production of satisfactory parts.

The control chart technique differs very little from the statistical analysis method. The original inspection and calculations are the same. Fig. 1 shows a typical part to which the control chart technique has been applied. Table 3 gives short history of the production of this part. It will be noted that an average of 22.3 percent of the parts inspected during this period were rejected. Another striking fact is the variation in the percentage of defective parts produced from day to day.

Fig. 3 shows the work sheets used in establishing statistical control over this item. A sample of 25 pieces was taken and each of the four critical dimensions were measured. From the measurements, the average X and the standard deviation δ for each dimension were calculated. The machine set-up was adjusted and the cutting tools were dressed until X was very close to the nominal drawing dimension, and three times the standard deviation (3δ) was less than one-half

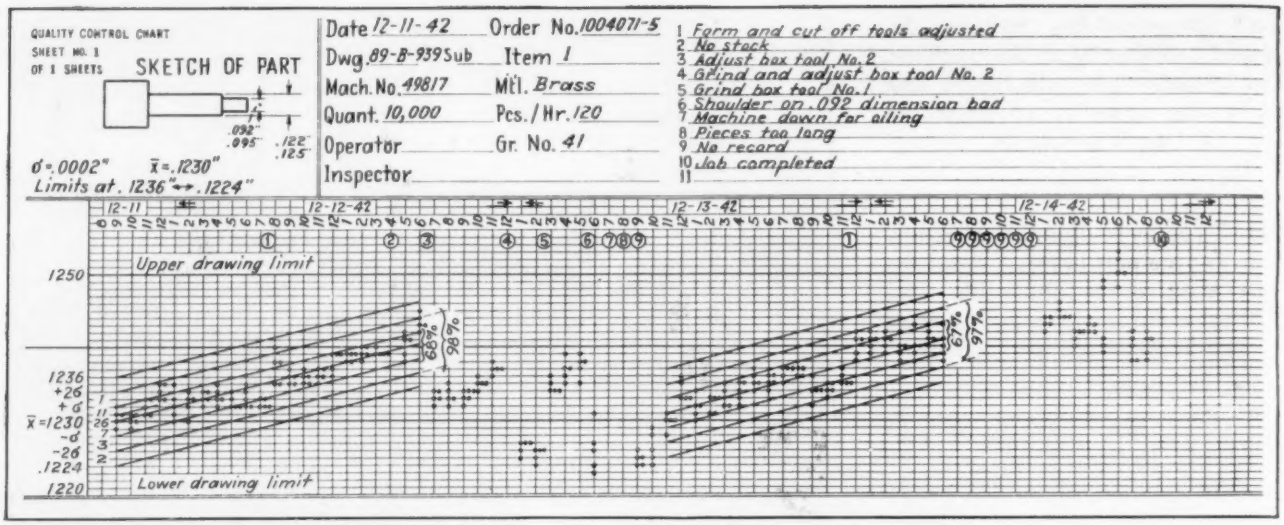


Fig. 4—This quality control chart is a complete log of what was done to the machine and tools, and shows that the set-up will run for 15 to 20 hours continuously without adjustment or tool dressing. On long runs it is possible to reduce unit costs, increase production, and produce quality parts that require little inspection

TABLE 3—Defect Record Before Using Quality Control

Date	Number inspected	Number rejected	Percent defective
7-18-42	1240	97	7.8
7-18-42	1240	381	30.7
7-20-42	1144	194	17.0
7-28-42	1478	198	13.4
7-28-42	1130	370	32.3
7-28-42	1549	919	59.3
7-31-42	1457	257	17.6
7-31-42	2090	450	21.5
7-31-42	1193	83	6.9
8-2-42	2200	630	28.6
8-2-42	1850	322	17.4
8-3-42	2150	300	14.0
8-3-42	1860	392	21.1
8-4-42	1327	287	21.6
Total	21,908	4,880	22.3

the drawing tolerance. The control chart limits were set at $X \pm 3\delta$. These limits were well within the band determined by the drawing tolerances.

Fig. 4 shows a typical control chart used for controlling the quality of parts which must be made to small tolerances. The chart is also a complete log of what was done to the machine and the tools during the running of the job. The chart shows that a good machine set-up will run for 15 to 20 hours continuously without requiring adjustment or dressing of tools. It is long runs like those shown on this chart that reduce unit costs, increase production, and produce good quality parts which require no inspection later.

Table 4 shows the history of the production on four successive days, three days when the control chart was used and one day when the control chart was not used. It might be argued that the period covered is not long enough to provide conclusive evidence. These are short runs; some orders are even shorter. But the pattern of the history is always the same, proving conclusively the value of the control chart for controlling quality.

Statistical methods require that the person using them have some training in these methods; they also require an understanding and sympathetic attitude on the part of the production organization—the shop people. It is a fact that the initial inspection and calculations to determine the average X and the standard deviation δ require an appreciable time and sometimes it is difficult to explain to the shop people that this work is necessary. To overcome these objections, a system of "first-piece+patrol+last piece" inspection has been developed which can control quality so that the production of defective parts is practically eliminated. This method is particularly adaptable to punch-press operations, welding and brazing operations, grinding operations, and fixture assembly operations where several parts are assembled and riveted in a machine. Also, it has been used on automatic and semi-automatic screw machines, turret lathes and grinding journals on shafts. This method requires no training beyond that possessed by the inspector who is to inspect the work.

After a set-up has been made and properly adjusted, it is run 15 or 20 minutes to allow the tools to become seasoned. This permits the edges of cutting tools to become stabilized, and holding and locating fixtures to become set. After this initial seasoning period two or three pieces are taken by the operator and carried to a first-piece inspection station. Here the inspector gives these pieces a thorough inspection; all dimensions are carefully checked; the height of burrs, when present, is observed; the hardness of the material is measured; and the shape of threads is observed. This inspection station is equipped to perform any inspection required on the parts coming through.

If the part or parts pass this initial inspection and are approved by the inspector, he makes out an operation inspection tag. The inspector shows on this tag the complete identification of the part by part number, the shop order on which the part is being made, and a description of the operation or operations which result in the production of the part. The identification of the material by material number is also shown by the inspector and he must satisfy himself that the part is made of that material. The date and time of day when the part is approved are shown on the tag as is also the signature of the inspector and designation of the manufacturing section. Instead of signing his name, the inspector may use a punch, similar to a conductor's ticket punch.

This tag, together with the part, is returned to the operator as his authority to proceed with the operation. Ordinarily the operation is shut down until the first piece is approved, but under

exceptional circumstances the operator may proceed with production. If the first piece is not approved, all parts produced must be inspected 100 percent until a satisfactory set-up is made. The operation inspection tag and the first piece which was approved by the inspector must both be displayed prominently at the work station while the operation is being performed. This first-piece inspection is followed by periodic patrol inspection of the operation. This patrol inspection may be made every hour in the case of automatic screw machines; every two hours in the case of spot welders and brazing machines; every three or four hours in the case of punch presses or molding operations. The length of time between inspections is determined by rapidity of tool wear, the closeness of the tolerances to which the parts are made, and the degree to which the operator has been made "quality conscious."

When making this periodic patrol inspection, the inspector walks up to the machine performing the operation and observes conditions in general. Is the die properly lubricated? Is the material being fed through the die clean and of the proper dimensions? Is it fed through properly? Is the work area clean and orderly? Is the operator observing safety rules? On a welder, is the timer functioning properly? Is the transformer too hot? Are welding tips worn or mushroomed? Is cooling water of the proper temperature? He then watches a part being made and inspects it by comparing it with the part approved at first-piece inspection. The two parts should be identical; any difference between them must be accounted for, as tool wear, shift in locating pins, or other changes in the set-up.

Patrol Inspection Controls Accuracy

If the part is satisfactory, the inspector enters the time of this inspection on the operation inspection tag. He also enters the total number of pieces which have been made up to the time of this inspection, if this information is available from a counter. If the part is not satisfactory, he removes the operation inspection tag from the machine and this automatically shuts down the operation. The operator then proceeds to correct the tools, or set-up, so as to bring the operation in control once more, or if he cannot do this by himself, he reports to his foreman.

All parts produced up to the time of the patrol inspection should be physically removed from the work area. If this cannot be done, these parts should be separated from parts produced subsequent to the inspection. The purpose of this separation is to avoid mixing good parts with defective parts in case something should happen to the set-up which would result in the production of defective parts.

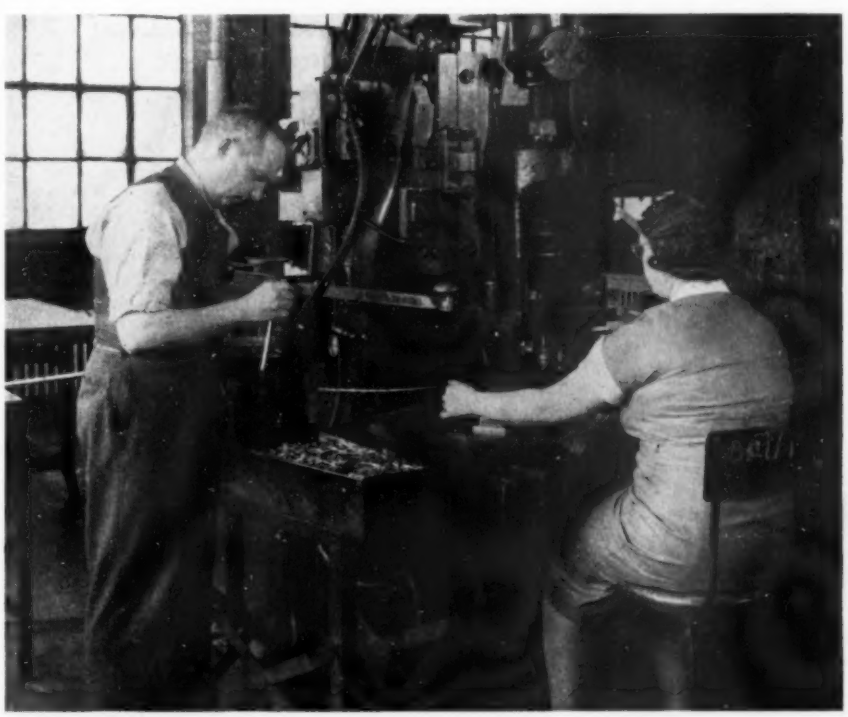
TABLE 4—Effects of Using Quality Control

Date	Number inspected	Number rejected	Percent rejected	Control chart used
3-2-43.....	1120	2	0.2	Yes
3-3-43.....	950	3	0.3	Yes
3-4-43.....		Sunday — no record		
3-5-43.....	840	17	2.0	Yes
3-5-43.....	850	117	12.0	No

At the end of the production run, the last one or two parts produced are inspected very carefully. The purpose of this inspection is to detect any changes in dimensions or quality between the first part inspected and this, the last part. These changes are interpreted in terms of tool wear, and the inspector decides whether the tool should be dressed, ground, or adjusted in any way before another order is started. He denotes this condition of the tool by checking the proper square, "yes," or "no" under the question "Does Tool Need Redressing?" at the bottom of the operation inspection tag.

If the tool needs redressing, the inspector makes out a salvage tag. The foreman, as well as the inspector, signs this tag. The act of signing this tag serves formal notice on the foreman that he has a tool in his department which requires regrinding.

All completed operation inspection tags are filed by part number. All tags pertaining to any part may be taken from this file and reviewed at any time. From this review it can be determined whether the part is one which is difficult to make to required quality standards, in which case a change in design, tooling or method manufacture might be advisable. If this review reveals that set-ups, once made, continue to the end of the order, and no defective parts are produced, then it can be assumed that the method of manufacture is satisfactory from the point of view of quality control.



Periodic inspection patrol follows first-piece inspection. Time between inspections is determined by rapidity of tool wear, closeness of tolerances on the parts, and the degree to which the operator is "quality conscious"

Four-Point Training for Women

BY RICHARD S. SCHULTZ, DIRECTOR METHODS FOR INDUSTRIAL RELATIONS, INC.
AND THOMAS APPLEGATE, TRAINEE INSTRUCTOR, THE LODGE & SHIPLEY MACHINE TOOL COMPANY

TRAINING WOMEN for war jobs in the least possible time, and with the use of a minimum of facilities, demands a streamlined and simple formula.

Lodge & Shipley Machine Tool Company reduced its program to a simplified four-point training plan of fundamentals for machine shop practice. Briefly, the program includes:

Use of 6-in. scale;
Reading a decimal chart;
Use of a micrometer;
Reading mechanical drawings.

The purpose of this streamlined training is, for the present, to make specialists—those who will be able to work on a certain machine, to do a certain bench operation or to work on inspection. The basic training for women in the shop is not to make them all-around mechanics but to develop them as quickly as possible as specialists. The purpose is to teach them work habits, knacks, and simple "tricks of the trade." This type of training rubs some of the "greenness" off of trainees.

Simplified training avoids cluttering the minds of new women workers with unnecessary knowledge. Each is taught to operate a certain machine rather than to become a machinist. Such simplification helps them learn quickly.

This plan helps them learn without embarrassment, gives them quickly the "whys" and "wherefores" of what they are doing, and builds individual and company morale. It quickly creates an interest in the job and right attitudes toward work, gives trainees good work habits and makes them self-dependent. They learn to do a job in a simple way with a satisfactory degree of skill. This is a foundation upon which craftsmanship may be further developed for men as well as women.

Before beginning the training each employee has an interview with the personnel director, who briefly explains the company, its policies and its requirements. The program of introducing new employees generally follows three steps:

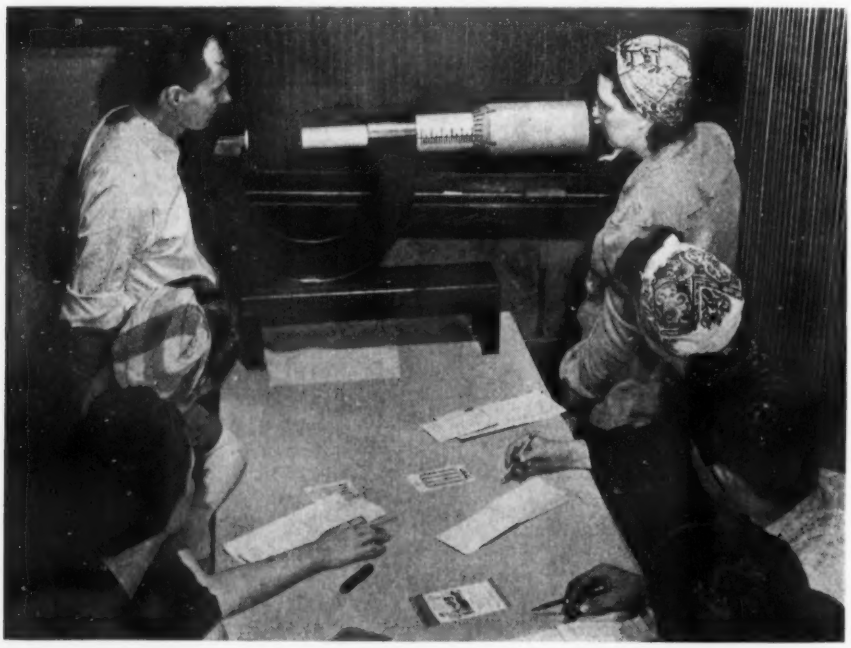
1. Introduction to the company spirit, products and personnel and its policies affecting employees and employee relations.
2. Training for the job as specialists.
3. Safety training.

The training program has a set course of 24 hours and begins by bringing new employees together in small groups not exceeding fifteen. They attend a regular classroom on the main shop floor for approximately two hours in the morning and two hours in the afternoon. The remainder of each day's time is devoted to making them "feel at home" in the shop.

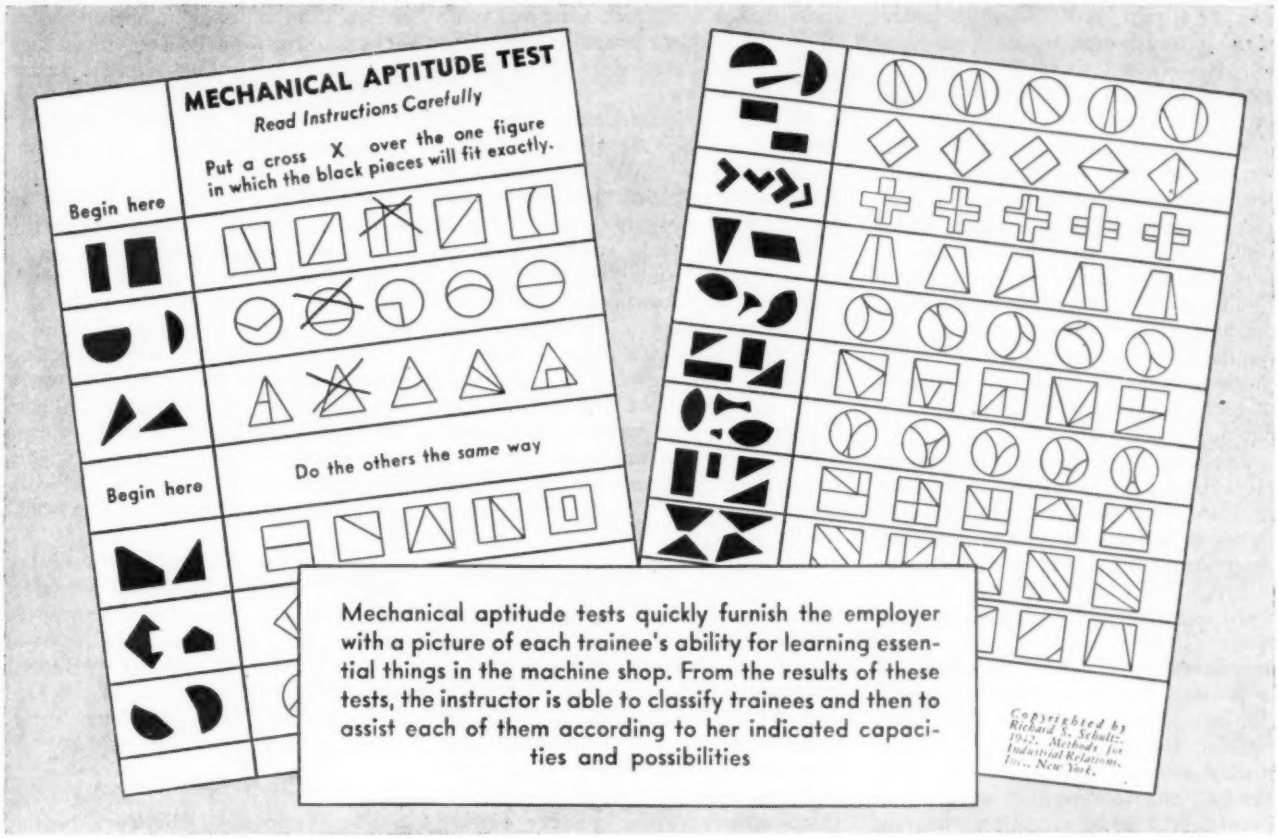
School training begins by doing things. The trainee instructor makes each step a learning step. There are no long talks. Everything is demonstrated. Each member of the group has a chance to try it. Learning is by doing. Many trainees have never thought of the need for reading a 6-in. scale. To some others it appears rather easy. Very soon they begin to realize how important it is to learn even this simple operation. For example, to many persons, $\frac{13}{32}$ or $\frac{15}{32}$ has little meaning unless it is translated in terms of everyday duties on the job. By easy stages they are taught, or their minds are refreshed on the meaning of a fraction, whether ¼ is the same as ⅜ or $\frac{5}{16}$. This is elementary, but for those who have been unaccustomed to working with simple figures it is quite a difficulty.

An enlargement of a 6-in. scale is placed before the group and every one is called upon to read off fractions. At the end of each step in this training program a test is given to find whether trainees are ready for the next step. The interest shown in these tests indicates that adults are very eager to learn, provided the learning situation has a direct connection with their jobs. From these tests, each worker gains confidence. Hesitancy, timidity and doubt are quickly translated into a feeling of being "at home" in the shop.

The next step in the program is training in reading a decimal chart. To present this lesson in a simple way, a very large blackboard decimal chart is hung in front of the group. Each member receives a little card on which are printed the decimal equivalents of fractions. The chart shows the connection between fractions and decimals,



A giant model of a micrometer facilitates training in the use of this important machine shop tool, and aids trainees in quickly acquiring skill in adjusting and making measurements with hand micrometers


MECHANICAL APTITUDE TEST
Read Instructions Carefully
Put a cross X over the one figure in which the black pieces will fit exactly.
Begin here
Begin here
Do the others the same way
Copyrighted by Richard S. Schultz, 1942. Methods for Industrial Relations, Inc., New York.

Mechanical aptitude tests quickly furnish the employer with a picture of each trainee's ability for learning essential things in the machine shop. From the results of these tests, the instructor is able to classify trainees and then to assist each of them according to her indicated capacities and possibilities

and makes clear how one may be converted into the other.

By this time the trainees are very much interested in their subject matter. Their interest has been maintained by giving them an opportunity to polish up their abilities in reading fractions and in converting fractions to decimals or vice versa. They practice and demonstrate their skill in the classroom. They are also requested to memorize eighteen fraction-decimal conversions.

Up to this point, they have refreshed their minds and their skills in simple arithmetic. On the following day, they walk into the room and they see a giant micrometer. Within a few minutes the group learns the facts of the most important tool in the machine shop. Each part of the micrometer is explained and demonstrated to them. Shortly they will know the answers to these questions: What is a frame? What is the anvil? What is a sleeve? What is a thimble?

Much is gained by such a simple training approach. The micrometer becomes to them an easy instrument to use in precision work. In addition, each trainee receives a folder on "How to Read a Micrometer" to take home and to read further.

Then small hand micrometers are passed out and each member of the group has an opportunity to learn to use them. Because of their previous training on the giant micrometer, they

TRAINING COURSE OUTLINE

1. Use of 6-in. scale and explanation of divisions

Show various divisions on wall chart. Practice converting fractions to other denominators. Questions on work covered. Trainee demonstration of scale parts. Test.

2. Decimal chart

Show connection between fractions and decimals. Find decimal equivalents to common fractions. Show method and practice converting fractions to decimals. Work simple decimal and fraction problems. Oral and written test of fractional and decimal problems.

3. Demonstration and explanation of micrometer

Show by arithmetic the number of threads in the micrometer and explain why it is such. Trainees practice with micrometers. Use and care of micrometers, all sizes. Questions. Oral demonstration test. Written test on care of micrometers.

4. Mechanical drawings

Explain use and purpose of drawings. Demonstrate simple block with glass cube. With help of trainees, draw other blocks on blackboard. Demonstrate simple lathe part with drawings. Illustrate and help pupils to draw other lathe parts. Final questions. Test of drawings.

quickly acquire skill in adjusting and making measurements with the hand micrometer and soon begin to take measurements in $\frac{1}{1000}$'s of an inch on carefully machined parts.

After this training on the micrometer, they are ready to become acquainted with other precision tools, such as vernier calipers, Johansson gage blocks, limit plugs and micrometer gages. In addition, they are given an opportunity to understand why employees in a machine shop must maintain a high standard of precision. A firm belief in the importance of quality is implanted in each worker's mind from the first day on the job.

Explanation of the Johansson blocks gives them an appreciation of precision standards and how the machine tool industry is enabled to maintain uniformity in its products and in its manufacturing. This impresses many workers and establishes the right attitude towards careful work. It is a simple and direct way of explaining quality of work and American craftsmanship in the machine tool industry.

From this point on the individual worker does not have to be told to be careful. She recognizes that her quality of work can be measured and must be done accurately. She has a micrometer and other precision devices to check very fine work. She realizes that what she has been taught will enable her to become a satisfactory worker.

In the last step of this program the trainees are faced with a real surprise. On the table before the group is a block within a "glass house." They learn that the glass case is a means of projecting views of the block. The block is drawn on the blackboard in three dimensions, then they are shown a simple lathe part with its drawing. From this they learn such facts as "What is the third dimension view? What is the dotted line? How are dimensions indicated in a drawing?" They also learn how to read dimensions on the drawing.

Why do some workers fail in the machine shop? It is not always because they cannot perform or do not know how to operate a lever or to adjust a machine. Very often it is obvious they have not obtained an appreciation of how to read a drawing. Or they have not tried to visualize what they are attempting to do. In making cuts on a machine it is necessary to have an appreciation of the third dimension. The glass house projection is the most simple and practical way of presenting it to them.

From this point on the "routing card," the shop drawing, operations to be performed, and the time standards begin to assume meaning. They can visualize and attach some real value to their work. A piece on a grinder or a lathe can be viewed as a part of the finished machine.

Not only do they learn to read and interpret but they are given an opportunity to make simple shop drawings. We usually think of drawings as being very complicated, and in the schools, it may take months to learn how to make suitable ones. But in two hours each member of the group is ready to make a drawing of the parts and views of a piece of metal to be cut on the lathe. They draw top, side and front views very quickly. The drawings are not perfect according to fine line drawing standards, but from preparing them trainees learn to appreciate the meanings of lines in a drawing.

Classified by Aptitude Tests

During the first day of the training program each woman of the group is given a short intelligence test in the morning and a special mechanical aptitude test in the afternoon. At the end of the first day the company has a picture of the trainee's ability for learning essential things in the machine shop. A few trainees quickly show their unsuitability for work in a machine shop. The trainee has a chance to learn about the work and the company becomes better acquainted with her. Thus, the first day serves as an initial hurdle in establishing, in a more comprehensive way than is customary, whether the employee is of value to the company and her interest and attitude toward work in the machine shop is revealed.

There is further value in the use of aptitude tests during training. It gives the instructor an opportunity to classify the trainees and to assist them according to their capacity and possibilities. Where the ratings are low, it definitely indicates the need for special training. If the ratings are high better use may be made of the indicated ability in the training and in special job assignments in the shop.

Shop Tours and Safety

The training is not merely classroom work. Another broad phase of the training program is shop tours. Each trainee has an opportunity to become familiar with the shop and to try some of the things learned in class. These shop assignments also include some bench practice.

Not only do employees learn four fundamental skills but they acquire the right attitude towards work and safety. The shop tours provide favorable opportunities for stressing safety. The trainee can see the appearance and the location of equipment and safety devices. Safety habits are emphasized by pointing to trained workers in the plant.

On these tours, trainees become accustomed to the shop environment and familiarize themselves with the plant. When they are actually put on a job there is little need for being concerned about the first few days of "getting used to the shop." They are all ready to begin with a right attitude and work pace for production.

After the complete training period the women may be assigned to work with an experienced employee. There are many advantages for the employee who serves as an instructor. It gives him additional help in getting work done and further develops his personal skill.

The foreman has the responsibility of taking the necessary steps to select and train the experienced employee so that the trainee will be sure to have a good instructor. Experienced employees are encouraged to improve their own skill, and they seem interested in teaching newcomers.

Why It Gets Results

The Lodge & Shipley Machine Tool Company is finding this streamlined program the solution of their man- and womanpower problem. The foresight and interest of President William L. Dolle is bolstered by works manager Fred Schoeffler's enthusiastic and careful planning of the training program. Other company executives and the foreman see clearly that the organization must assume full responsibility for successful training of its women employees if the Victory Production Schedule is to be met without any faltering.

The four-point training program has the following principal features:

It is simple, requires no unusual facilities or personnel.

It is a quick way of training women for production in the machine tool industry.

It is a workable training program.

The plan is set up so that an ordinary shop man can do the training.

It begins with the fundamentals, makes each new woman employee a specialist and provides her with skills that she can use very quickly in production from the first day on the job.

It builds morale, confidence and interest among new women employees. It is also one direct way of keeping a lower rate of absenteeism and turnover.

It preserves the high standards of quality and precision of American craftsmanship in the machine tool industry.

Postwar Disposal of Machine Tools

After the War—What?

J. R. Porter's article, suggesting postwar disposition of surplus machine tools, continues to stir discussion. Mr. Porter suggested that the government consign surplus government-owned machines to the original manufacturer and not exact payment until the machine is sold. What do you think about this problem?

Keep War Plants In Stand-By Condition

By R. L. GIEBEL, Giebel Machine Tool Company

Both manufacturers and dealers of machine tools have always had the guts to stand on their own two feet without crying to the Federal Government for special favors. All they expect is a square deal with the privilege of solving their own problems with a minimum of government interference.

Regardless of the theoretical plans and admirable Christian hopes indulged in by the leaders of the Allied Nations, our country should stay armed and keep at least 50 percent of the war production equipment either in use or ready to be used at a moment's notice. Our war facilities should not be dismantled until at least five years after the close of this war. We must not be caught unprepared again. We likewise cannot afford to stop production and throw thousands of men out of work until private industry can take up the slack.

The remaining 50 percent should be divided into two classifications. The special-purpose machines should be stored in plants the government now owns and be drawn upon only for the continuous armament production. The standard machines should be prepared for export shipment and either sold or lend-leased to foreign countries. We understand, of course, that lend-lease means "giving" with no strings attached which is perhaps, from a financial viewpoint, not quite as good as 25 cents on a dollar. No government-owned machines should be sold to the general public until the country is on a normal production basis.

It seems to me a government-owned corporation, something like the R.F.C., should be organized to handle all the equipment, regardless of what division of the government originally purchased it, and how it is to be assigned. Four or five divisions having responsibility of disposing of this equipment would mean confusion, duplication of effort and too many non-producers on the federal payroll.

Private industries, both large and small, will gradually switch back to peacetime operations. Manufacturers of automotive, household and other necessities may try to "beat the gun," provided they can see a way to make and retain a profit. After manufacturers have perfected their products and are in a position to judge the demand, they will want to equip their factories with the most productive machines available. A great many of the machine tools we are producing are obsolete. They would have been discarded if the manufacturer had not been pressed for maximum production.

There are many manufacturers of machine tools who will either go out of existence or switch to some other type of product. They are now known as "War Babies." They have done an excellent job filling in the gap and, in many cases, sacrificed their own future by doing so. They will take care of themselves if given half a break.

Use Excess Machines For Postwar Rehabilitation

By A. R. STEDFAST, Stedfast & Roulston, Inc.

A portion of the tools owned by the United States Government should be distributed to the southern states, allowing them to manufacture on a larger scale than at present. This would take some of the machines out of the market and put them to work for the benefit of the United States.

A number of these machines should be shipped to our good neighbors in South America, to help them in the advancement of manufacturing, while furthering our Good Neighbor Policy.

Inasmuch as the Axis-conquered countries have been stripped of much of their machinery, we could, through lend-lease probably, allow them to take a large number of these machines to rehabilitate their countries.

In these ways we could dispose of quite a number of the machines. Eventually the up-to-date manufacturers will redesign their lines for the postwar period and improved machine tools will be put on the market.

ABC of the "Mike"

BY LEWIS W. SPAULDING

Many years ago I sent you a simple article explaining the principle of the micrometer. It was published at that time, and I was sent a L. S. Starrett bench level for this short article.

Right now I use this idea in teaching war workers and am surprised to see other instructors still making their explanations needlessly involved. Micro = small; meter = to measure; hence the micrometer is a tool for making small measurements.

1. Every micrometer spindle has 40 threads to 1 in. Hence, it must be turned 40 turns to move the spindle 1 in.

2. One turn moves the spindle 1/40 in.

3. The thimble by which the spindle is turned has 25 equal graduations on it.

4. Turning this thimble one graduation turns the spindle 1/25 of 1/40 in. or 0.001 in.

This is why and where the 0.001 in. comes about.

What Makes a METAL-CLEANING PROGRAM

BY DR. R. W. MITCHELL, TECHNICAL DIRECTOR, AND MARCEL T. ZINTY, CHIEF ENGINEER, MACHINE DIVISION, MAGNUS CHEMICAL COMPANY

This consideration of the factors involved in planning a metal-cleaning set-up begins a new series of articles on how to remove manufacturing dirts. Makers of cleaning equipment have developed methods, materials and machines to assure clean surfaces under virtually all conditions of production. The experience of the authors should be of great assistance in the choice of the best means of handling a particular cleaning job

FACTORS IN PLANNING A CLEANING PROGRAM

In the Choice of Material:

1. Condition of parts to be cleaned
2. Nature and adherence of the dirt
3. Degree of cleanliness required
4. Kind of metal to be cleaned

In the Choice of Method:

1. Shape of parts to be cleaned
2. Size of the parts
3. Degree of fragility of the parts

In the Choice of Machine:

1. Quantity of parts to be cleaned
2. Nature of the finish
3. Additional operations included
4. Means of heating solutions
5. Available floor space
6. Place in production flow

THE FINISH on any metal object—whether it be gun, tank, plane or jeep—depends to a large degree on the cleanliness of the surface. Since the finish is one of the most important factors in how the part stands up, methods of cleaning can hardly be given too much attention. This is especially true in wartime when our fighting equipment must be produced fast and be able to stand up under the severest conditions of use.

War production is almost always a question of volume. Cleaning methods which apply in peacetime are not always suitable to the scale or quality of war production. When the job is further complicated by the lack of trained workers, metal cleaning, like most other operations, should be made as nearly automatic as possible. In no other way can cleaning speed match the rate of other phases of the production line. For this reason a consideration of special machines is forced on most plants.

The type of machine best suited to any cleaning operation depends on the cleaning materials used and on the methods imposed by the nature of the problem and the kind of cleaner. Moreover, the materials and methods must be chosen to meet the particular conditions imposed by the shape, size and material of the article to be cleaned, by the kind of dirt, the degree of cleanliness required, and above all, by the finish to be given the article.

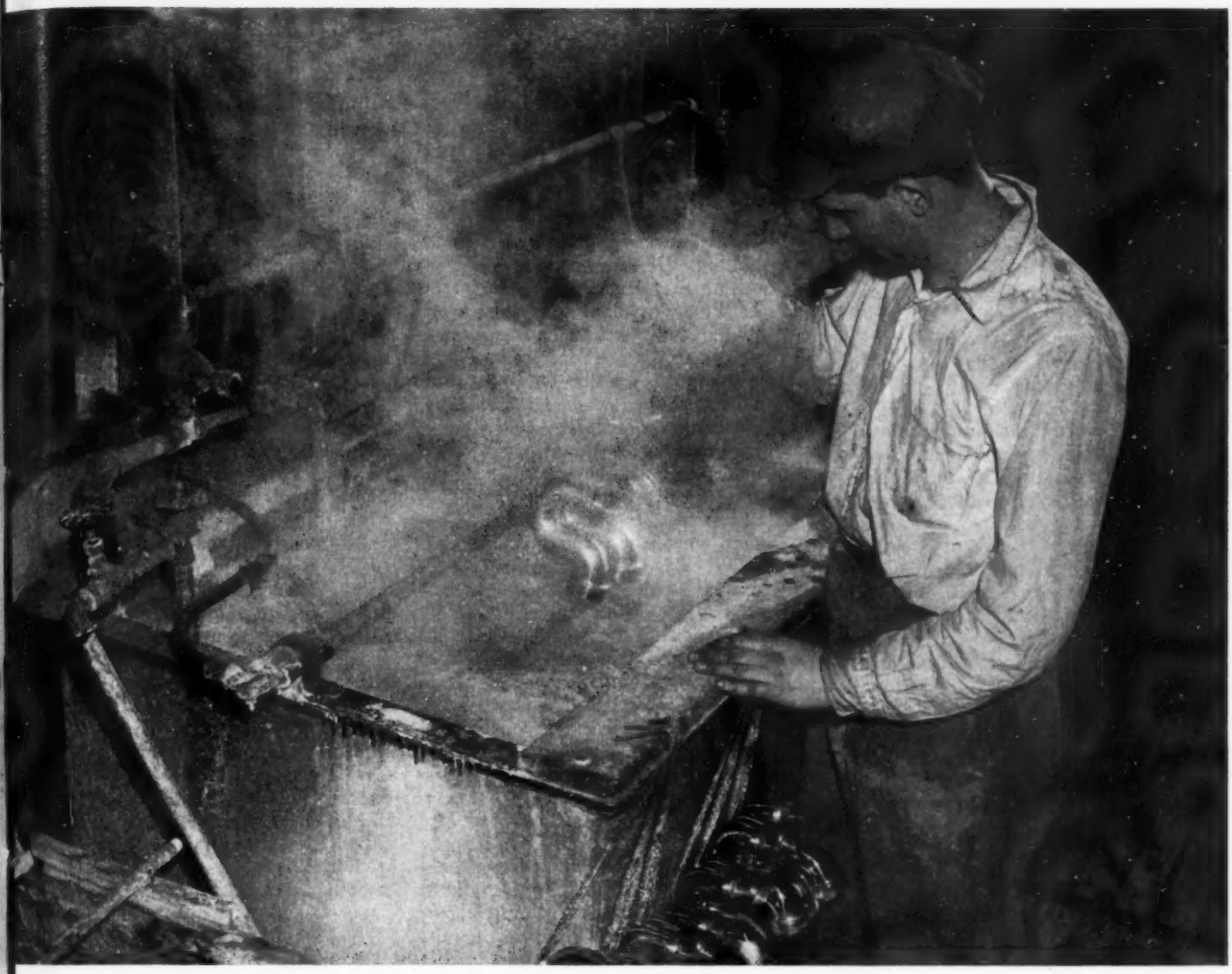
Broadly speaking, the cleaning material selected depends on the nature of the dirt to be removed and the kind of metal to be cleaned. The cleaning method depends on the shape of the parts to be cleaned. The machine to be used depends on the production rate required and the method selected. When all the other data has been analyzed, the relative overall cost of various materials, methods and machines remains to be studied.

Methods and Materials

In laying out a cleaning program the first step is to choose the materials and the method. Certain types of machines may not be suitable to the method and materials chosen; but once they are chosen, it is always possible to design a machine which will fit all the conditions. However, the fact that a machine can be designed to handle any cleaning problem does not necessarily mean that a machine is inevitably needed. The output required by the production schedule may not warrant either a fully automatic or a semi-automatic washing machine; it may be adequately assured by a properly arranged series of tanks, with or without material handling devices.

CONDITION OF PARTS. There are varying degrees of dirtiness. Many parts have only a light deposit of dirt which can be removed by methods and materials which would be inadequate for heavier deposits. However, many dirts impair certain types of cleaning solutions, so that where deposits are heavy, the question of effective life of cleaning solutions is an important one.

NATURE AND ADHERENCE OF DIRT. The word dirt covers any material which must be removed from the metal, so that it is important to understand the nature of the specific materials to be removed. Many materials which respond readily to a certain type of



cleaner are not touched by other types. The cutting lubricants, coolants, drawing and stamping compounds, polishing and buffing compounds and similar materials used in processing metals vary widely in their constituents. It is not enough to know that a drawing compound or a coolant must be removed. Its basic ingredients must also be known. If this information is not obtainable, then suitable tests must be made to determine the ability of the various available cleaning materials to remove the compound.

Often a cleaning operation which has been completely satisfactory for years suddenly "goes sour," even though the same cleaner, the same method and the same equipment are in use. Almost invariably investigation will show that a change has been made in the lubricating compound, the buffing or polishing material, or some similar source of dirt which has introduced an ingredient not handled by the old cleaning method. It is usually easier and more economical to select lubricants, particularly drawing or stamping compounds, which are readily and effectively handled by the more commonly used cleaning compounds, than to be forced to change cleaning materials and methods to suit a special type of lubricant.

In addition to the kinds of dirt so far discussed there is also a heterogeneous class of solid particle dirt, including metal chips and particles, emergy grains, other abrasive particles, shop dirt of all kinds, which will be present in some degree on practically all metal objects requiring cleaning. The removal of this solid-particle dirt presents one of the most difficult phases of many cleaning problems

Often machines which have been in service must be cleaned prior to adjustment, maintenance work or repairs. Washing machines are not so frequently used for this kind of cleaning operation, but the question of suitable cleaning materials and methods still depends on the kind of dirt to be removed. This will vary widely—from caked oil and grease, sand, gravel, tar, mud to carbonized greases and oils—in accordance with the kind of object to be cleaned and its service.

In addition to the nature of the dirt, there is the equally important question of its degree of adherence to the metal surfaces. At one end of the scale is the effect obtained when a clean piece of metal is dipped into a container of slightly moist sawdust. There would be practically no adherence of such dirt to the metal and it could be washed off by dipping in plain water. On the other extreme, take the example of "smut" on steel. Here we have a dirt which responds to very few cleaning materials. It is made up of very fine iron oxide scale (Fe_3O_4) and equally finely divided carbon, each of which has a high degree of adherence to the metal surface. In between these two extremes are a wide variety of degrees of adherence.

DEGREE OF CLEANLINESS. Cleaning prior to painting and lacquering usually requires a physically clean surface. This means that all gross surface dirt has been removed. Cleaning prior to electroplating demands a chemically clean surface, one from which all traces of oil or grease have been so thoroughly removed that a "water break" does not

occur and from which all solid particle dirt has been disengaged, oxides in the form of rust or tarnish removed and even absorbed gases displaced. However, there are some cleaning operations which do not have to proceed even as far as a physically clean surface. For example, the rough painting of machinery can be safely and satisfactorily undertaken on surfaces which are only relatively clean.

KIND OF METAL. The kind of metal to be cleaned affects the selection of the cleaning material far more than it does the design of the cleaning machine, since the cleaning material may be radically affected by the action of the material on the metal. For example, strongly alkaline cleaners may be indicated because of the degree of dirtiness, the nature of the dirt, and the degree of cleanliness required. But they could not be used on aluminum, brass or zinc, because of the tarnishing action of such cleaners, which might, under certain conditions, extend to serious etching or corrosion. But here the emulsifying cleaner method is serviceable because it has no harmful effect on any metal. If the shape of the parts to be cleaned permits its use, no attention need be paid to the kind of metal.

Washing Machines

Though some of the factors in the choice of method and materials affect the choice of the washing machine—for example, the dirtiness of the parts or the state of cleanliness required may call for one-, two-, three- or four-stage cleaning—there are still several major factors which govern the actual type to be used. Among these are the shape, size and degree of fragility of the parts.

SHAPE, SIZE AND DEGREE OF FRAGILITY. The shape of the part is particularly important, since intricate objects with deep recesses or hollows may be difficult to clean, drain and rinse. With deeply recessed objects which are easily nicked, dented or deformed, special methods are necessary to insure contact with the cleaning solution as well as adequate drainage or rinsing. Further, objects may tend to nest in such ways that blind recesses are formed when the work is packed in bulk.

Effective and economical means of handling work obviously depend on the size of the units. Small parts are almost invariably handled in bulk on racks or in baskets, depending on their shape and relative fragility. Many small pieces which are hollow or recessed or tend to nest may be put through rotating drums in bulk when their fragile nature does not preclude such handling methods. Medium sized parts are most frequently handled individually on flat or chain conveyors, or special attachments if they are fragile. Large parts, always individually handled, are usually carried on flat or overhead conveyors or revolving tables. Recessed and fragile large parts are usually handled in containers which prevent movements that would lead to damage in handling. Very large units requiring cleaning may have to be handled on special types of conveyors or platforms.

On all hollow parts great care must be taken to insure proper contact with the cleaning solution and adequate drainage. When washed individually, such parts are generally placed in a vertical position, openings down. When handled in bulk, they must be rotated to insure full washing and draining.

The type of washing machine required where the volume of objects to be cleaned is large is more or less determined by the type of conveyor best suited to the shape, size and fragility of the pieces. On small scale work, a simple heated tank will be satisfactory for small and medium pieces, while larger heated tanks provided with suitable handling equipment are adaptable to large units in small lots. Many very large pieces can be cleaned with the emulsifying cleaner method by spraying and pressure rinsing.

QUANTITY OF PARTS. The quantity to be cleaned will govern the dimensions and type of washing machine to be used. Actually this quantity factor should be considered in terms of units per hour. The output required from the cleaning equipment will decide how much automatic handling is required. Broadly speaking, on flat conveyor machines the output is directly proportional to the width of the conveyor belt and the conveyor speed. On drum machines the output depends on the worm pitch and diameter and the revolutions per minute.

CONDITION OF FINISH. Whether the washing machine should be provided with a drying or cooling section, or both, depends on how the parts should be delivered. Many objects contain sufficient metal so that when washed or rinsed in hot solutions and hot water, they are self-drying. In most cases of this kind, the work would issue from the machine too hot to handle manually unless a cooling section is provided. On the other hand, many thin objects do not store enough heat to be self-drying and a drying section is necessary, though their lightness may also make a cooling zone unnecessary.

ADDITIONAL OPERATIONS. Often additional operations can be included in the washing sequence to eliminate separate manual handling. For example, pickling, burnishing, anti-rusting or bonderizing can be readily incorporated in a washing machine. So can painting, baking and copper plating.

HEATING SOLUTIONS AND RINSES. While heating is not always necessary (as in the case of the emulsifying cleaner method), it is usually a condition of the cleaning operation. Steam coils or immersion gas burners are the most commonly used methods. However, it may be more desirable to heat by oil burners or by electricity.

FLOOR SPACE. Often floor space is at such a premium that successive operations have to be provided for by being laid out in vertical rather than in horizontal sequence. To save room and to meet other special requirements, machines can be laid out with double conveyors to give a 100 percent increase in output for the same area.

PRECEDING AND SUCCEEDING OPERATIONS. Before and after the washing operation smooth production may call for tie-in with a method of handling parts which does not conform to that decided upon for the machine itself. Hence any decisions as to the type of machine must bear in mind the means available for getting the work to and from the washing machine. Machines may be designed to load at one end and discharge at the other, or they may load and discharge at the same end. In either case, the material handling method should be designed to effect smooth production flow.

Relative Cost

While the proportion of total production cost chargeable to cleaning is usually low, there are considerable economies to be obtained by the choice of the most effective cleaners. However, it should be emphasized that in making cost comparisons, it is not the cost of the cleaning material per pound that is decisive. Instead it is the relative cost of cleaning so many pounds of metal or so many square feet of metal surface. It is not uncommon to find that a method in which a cleaner costs much more per pound than other types will be the most economical when compared on the overall cost basis.

Moreover, in making cost comparisons, the ultimate choice of the type of cleaning machine also enters the picture. If a desirable cleaner shows up on tests to be superior in cleaning costs on the basis of pounds or square feet of metal cleaned, and the use of this cleaner entails rather costly alterations in existing cleaning machines or the design of new machines of considerable complexity, it might be more economical in the long run to use a somewhat more expensive cleaner which could give the required results in less complex machines, or which could be adapted to existing machines.

TRANSPORTATION—a vital war factor

The effectiveness of our armed forces and civilians alike depends on the efficiency of our transportation

As the battle of Tunisia entered its final phases, with the British and American forces joining hands to crowd Rommel into his last fox hole, Hitler and Mussolini held their twelfth war-time meeting.

One important purpose of this meeting, according to the Berlin radio, was the study of a specially prepared "Survey of Continental Reserves". Topping this list of resources is the item of transportation.

Hitler has a great many headaches these days but, according to no less an authority than the Reich Ministry of Economics, "the central problem of the whole German war effort is transportation". It is, in fact, the Achilles' heel of Germany's War Machine.

The Nazis have become soberly conscious of its crucial importance and Mr. Hitler must wince when he recalls the gigantic miscalculations which led him to neglect his railways.

He counted on a short war, not a long wear-and-tear war and Germany's transportation crisis is getting more critical by the hour. It will play a vital part in its defeat.

This is a war of movement—on land, on sea and in the air. Russia's 2,000 mile battleline, R.A.F.'s 700 mile bombing raids, General Montgomery's 1,500 mile advance last November and the vast area that constitutes the theatre of war in the Pacific make this fairly obvious.

Peace will come when one side gets control over the world's supply of fuel, oil and rubber, for on these three critical materials depend all the vehicles of war—as well as of peace.

An army used to travel on its stomach. Today it travels on its fuel tank.

On the home front, transportation is no less vital. Here it is essential in getting the war workers, their raw materials and their products, to and from the mines, mills and factories that supply our armed forces and those of our Allies. Transportation is a major factor in the nation's ability to out-produce its enemies. Every known method, every type of vehicle becomes essential, for no single group of carriers, freight or passenger, can meet all our needs.

The railroads opened the vast resources of our nation and continue to be the backbone of our transportation system. Today they are doing the greatest job in their history. They are hauling more tons of freight more miles than ever before—33% more than in 1941 and 55% more than in 1918, peak year of the first World War. They are carrying more passengers more miles than ever before—80% more than in 1941 and 24% more than in 1918. They are getting more work out of each car, each engine, and each mile of track than ever before. Private operation of railroads is proving far more effective and efficient in this war than did government operation in the last war.

This is the eleventh of a series of editorials appearing monthly in all McGraw-Hill publications, reaching more than one and one-half million readers, and in daily newspapers in New York, Chicago and Washington, D. C. They are dedicated to the purpose of telling the part that each industry is playing in the war effort and of informing the public on the magnificent war-production accomplishments of America's industries.

In contrast to Hitler's Germany, the managers of the American railroads have not neglected their plant except where government priorities forced them to do so. They are turning in an unprecedented performance despite the long starvation period to which they were subjected. During the first World War the total investment in the American railroad plant was about $18,600,000,000. Since then $12,000,000,000 have been spent on improvements and after deductions for scrapped facilities the net increase has been $8,000,000,000. Since the present war in Europe began the railroads have invested about $1,650,000,000 in further improvements, many of them to meet special war needs.

Convincing evidence of the railroads' flexibility in meeting the special needs of all-out war is their performance in coping with the movement of oil to the East Coast. In January 1942, one month following Pearl Harbor, the railroads delivered to the East Coast by tank car less than 100,000 barrels daily. By December they had stepped this up to more than 740,000 barrels and during the week ended April 3, 1943 they

averaged more than 900,000 barrels per day. By the end of this year they are shooting for the goal of one million barrels a day.

Unlike Germany we have not attempted to control the development and growth of motor transportation according to the "intuitions" of one man but have wisely left it in the hands of experienced competition. That is how our highway transportation system came into being. Growing public acceptance has made it an essential part of our national economy.

The motor vehicle, its limitations set only by the improved highway and the supply of fuel and rubber, has developed to undreamed of proportions. Up to a year ago private automobiles consistently moved more people more miles than *all public carriers combined*. Buses have become an accepted means of mass transportation. Local electric and interurban railways in many cases were converted to bus lines and trucks took over the local freight services. Under these improved operating conditions traffic volume increased. When the war in the Pacific made it necessary for us to conserve our supply of rubber and the U-boat depredations in the Atlantic throttled the flow of gasoline to the eastern seaboard, our motor transport was forced to grapple with the toughest problem that ever had confronted it since it became so vital a factor in the every day transportation.

The "share-the-ride" idea recognizes the need of conserving gas, oil and rubber. This particularly applies to buses, for wherever groups can be assembled for a common destination, buses can be used most effectively. The intercity bus performs for the rural areas the same service that the local bus renders for the residential areas of our cities.

Reorganization of railroad schedules, adaptation of motor transport, rearrangement of working hours, all have contributed to provide a flexible transportation service for men and materials to meet the critical needs of the war effort. Twenty thousand intercity buses are handling 635 million passengers a year which is 69 per cent more than in 1941. The fact that these buses carry a relatively larger percentage of the total coach passenger business than their seating capacity would indicate suggests that here, too, we are getting a more efficient use of these vehicles in terms of passenger loads carried. It is fortunate to note that the geographic location of most intercity bus lines does not coincide with that of the railroads but rather supplements it.

The contribution which the urban transport industry is making to the war effort becomes apparent when we consider that buses, trolley buses and street cars today carry passengers at a rate which promises to exceed the impressive total of 21 billions, as compared with 18 billions in 1942 and an average of 13½ billions for the period 1936 to 1941. And this the industry is accomplishing with a minimum of added equipment and despite a serious drain on its manpower.

The truck lines, too, are setting all-time records. They have rearranged their schedules, eliminated circuitous routes and coordinated their services with those of other carriers. As this is written, contract trucker with the cooperation of the Office of Defense Transportation are trying to eliminate the empty return trip.

The transportation industry as a whole is face to face with the biggest job in its history. Increasing traffic loads, with little if any new equipment, difficulty in obtaining essential maintenance materials and a growing shortage of manpower, combine to make it that. While federal authorities, acting through the Office of Defense Transportation, took prompt cognizance of this condition, froze equipment and otherwise acted to conserve the vehicles then in service, it was not possible to add sufficient vehicles to keep pace with the increased traffic demand. However, the O.D.T. did lend impetus to the movement for staggering hours of work thereby spreading the peak loads and thus increasing the carrying power of existing fleets of vehicles in city service.

As we review the problems involved in meeting our transportation needs it is evident that we cannot depend upon new equipment alone for their solution. Lend-Lease is taking a considerable share of our much needed output of transportation equipment. The immediate job is up to the rank and file of the transportation industries. It is up to their resourcefulness and devotion to their job. The operating men out on the road, the men in the shops who keep the equipment going, who make the most of the metals and other materials they can have, who salvage, conserve and economize . . . these are the men who must bear the burden of our war load.

Theirs is a dramatic story, a story of cooperation and coordination . . . of ever increasing capacity on a shoestring allowance of new equipment.

For this is a war of movement. According to Joseph B. Eastman, Director of Defense Transportation, both the passenger and the freight traffic on the railroads is to a large extent war traffic – the transportation of troops and civilians on war business, the movement of food, raw materials and finished products required for the prosecution of the war. As Mr. Eastman put it, delayed arrival of troops at embarkation ports, delayed delivery of vital war materials could even conceivably mean the loss of men at the fighting front. And what Director Eastman says of the railroads applies to all forms of transportation. Transportation by bus, by street car, by truck, by train, by ship and by plane . . . all play a vital part in the achievement of victory . . . on the home front and on the fighting front which relies upon it.

President, McGraw-Hill Publishing Company, Inc.

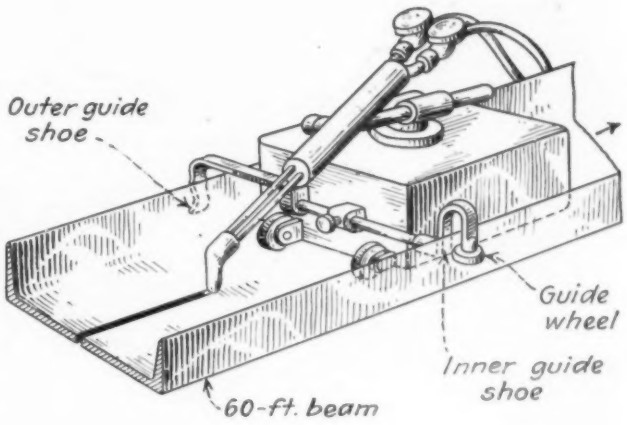
War Winning SUGGESTIONS

The following ideas were selected from those recognized as meritorious by the Board for Individual Awards, War Production Drive. They are freely offered to industry as an aid to its war production.

Router Guide Eliminates Hand Snips

Prior to the use of the illustrated router guide for removing surplus metal from a portion of an airplane engine cowling, this operation was performed with hand cutters or snips. The yoke slips over the edge of the cowling, and the operator pulls the anvil against the metal. The cutter operates pneumatically as the guide "tracks" against a channel running parallel with the edge of the material. In cases where no channel or stiffener exists, the tool is not used. It leaves a $\frac{1}{16}$-in. flange which is later filed smooth and flush with the channel. The filing required is less than that necessary when the metal is cut with hand snips.

With increased production schedules, and the influx of many workers of limited skill, trimming of sheet-metal cowling with hand snip was inadequate. The router guide removes surplus metal 228 percent faster, and with greater accuracy than even the most skilled worker could do by hand. *Suggested by John Rickert, Jr., Airplane Division, Curtiss-Wright Corporation.*



Torch Guide Splits I-Beams Quickly

Because of the shortage of material, shipyards have to cut I-beams and channel irons to produce T- and L-beams for use as stiffeners. It is general practice to cut a 60-ft. beam into 10-ft. lengths, transport these sections to an adjacent area and then split the sections longitudinally with an oxy-acetylene torch to form the finished stiffeners. The transportation of the cut beam sections requires the services of a crane, two laborers and a rigger, since they are too heavy to be carried by hand.

It was customary practice to draw a centerline down the middle of the beam as a guide for the operator. The flame cutting was then done by hand, often resulting in irregular splitting of the 60-ft. beam.

The torch guide shown in the drawing was designed to split the 60-ft. beams before flame cutting them transversely into the desired shorter lengths, which are then light enough to be carried wherever desired by two men. The flame-cut edges are clean and straight, which was not always the case when the previous method was used.

This method of making T- and L-shaped stiffeners dispenses with the need for a crane and a rigger. Since the machine has to be set up but once for each 60-ft. beam, compared to nine times when the beams were first cut transversely, 18 min. is saved in the cutting of each beam. *Suggested by Mark McDonough, Richmond Shipyard No. 1, Permanente Metals Corporation.*

Simplifies the Bending of Aircraft Tubes

Tube bending by hand is a tricky operation when successive bends must be made to almost watch-like precision to assure speedy and correct installation of the many sections of tubing which go into the complicated interiors of modern fighter and bomber airplanes. The regular bending apparatus accurately controls the direction and degree of the bend it is forming; however, the angular relationship between the bends must be calculated by a skilled operator who places the tube in the bending device, and holds a mock-up or sample completely bent tube from which to determine the proper position of the tube in the bender. At best, there is usually some variation in the finished tubes. Such variations have to be corrected, usually while the tubes are being assembled. This slows production materially.

The simple inexpensive stop illustrated here is used to make successive bends quickly and accurately. It has a series of adjustments which are set from blueprints, and insures that each bend is in exact relation to the previous one. By placing a tube in the bending device, so that the section of tubing affected by the last bend is flush against this stop, the most inexperienced operator can make these bends with accuracy and speed.

The operator in the illustration has taken a tube from the group in the foreground, and is about to bend it to the shape of those to his right. The part previously bent is placed flush against the special stop shown at the right-hand end of the tube being held in the bender. Although, for photographic illustration, a rather simple bend is shown, the use of this locating device is not limited by the number of bends in a piece.

This stop saves approximately 35 percent of the time formerly required to bend tubes. *Suggested by Walter L. Gibbons, Airplane Division, Curtiss-Wright Corporation.*

Plaster Molds Speed Machine Set-ups

When machining irregular pieces of metal the set-up requires the use of complicated and often expensive jigs or fixtures. Instead of making these it is often possible to build a form around the work and pour patternmakers' plaster into the form; frequently, however, it is advisable to use

an alloy with a low melting temperature that can be removed after machining by the simple expedient of pouring boiling water over it. When the forms are removed, a solid block of plaster or alloy metal remains which can be clamped to the machine table.

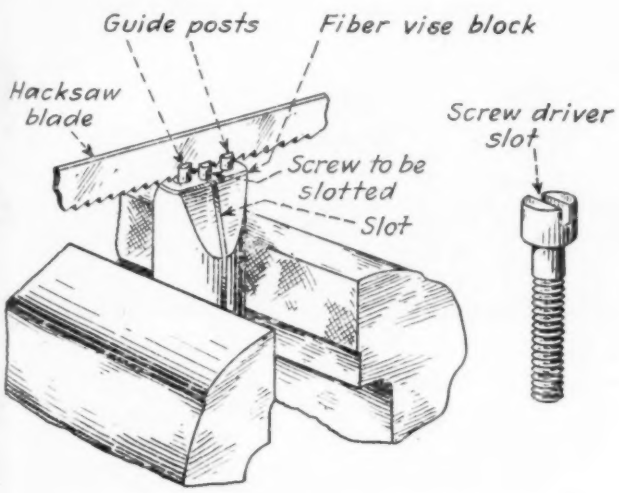
This method was tried on an order of 570 pieces after all other methods failed. Half of this order was right-hand pieces; the other half was left-hand. The procedure described was successful from the beginning, and provided a fool-proof set-up that saved many hours of labor. Estimated savings on the order of 570 pieces were $1,000. *Suggested by Alexander Thomson, Goodyear Tire and Rubber Company.*

Screws Held and Slotted in Fiber Block

Bushings and liners sometimes used with salvage parts to restore them to specified size are usually secured by small screws. These screws are very small and, after being driven home, the heads are twisted off and the ends peened to make a tight anchorage. In making these screws, the cutting of the screwdriver slot was a time-consuming operation. The part was held in a vise, the slot started with a hand file, and finished with a hacksaw.

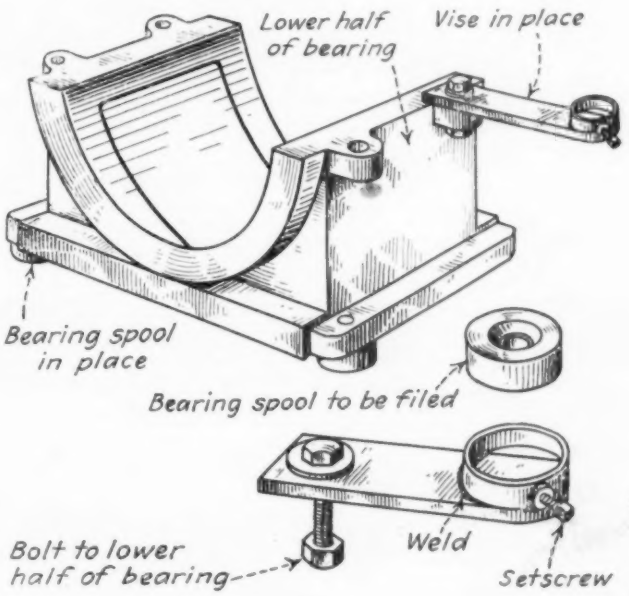
A fiber vise block is now used for this work. A slot cut in the fiber block allows the screw to be dropped in place as far as the head—tightening the vise holds the screws firmly in place. Two slotted guide posts screwed into the fiber holder project higher than the head of the screw and permit the sawing to be done accurately and to the proper depth. The posts are aligned and press-fitted into the block.

Care must be exercised in this operation, since the slot must be centered and cut to a certain depth to permit the screw to be driven without breaking and to make a clean break possible when the head is twisted off. From 800 to 1,200 of these screws are used each week. With the fiber-block holders, the time consumed in slotting the screws has been reduced 20 percent. *Suggested by Robert Newton, Aircraft Engine Division, Packard Motor Car Company.*



Close-Quarter Filing of Bearing Spools

The shaft tunnel in any ship is at best close and cramped quarters. When assembling the propeller drive shafts, bearing spools are used to level the shaft bearing housings. Variations in the surfaces of these housings make it necessary to file the bearing spools so the housings will set level and maintain equal pressure on all bearings sustaining the propeller drive shaft. The bearing spools or chock blocks are placed between the top of the drive shaft bearing foundations and the base of the bearing housings.



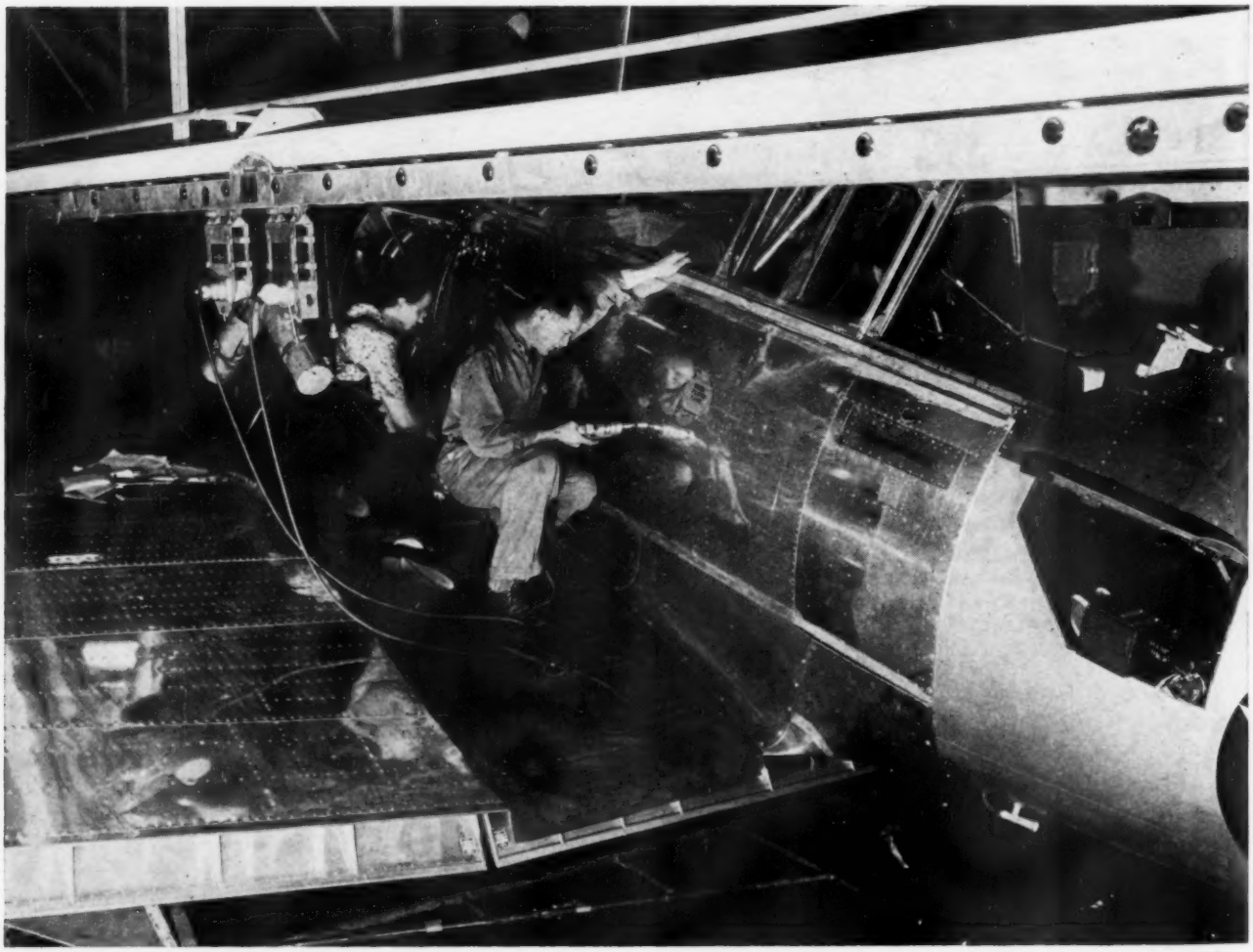
Each block must be fitted to the bearing housing during assembly. This is done by filing, and unless the filed surface is parallel with the base of the block, high spots throw the housing out of alignment or cause unequal pressure on the blocks. Filing is hampered by the close quarters in the shaft tunnel.

Difficulties were encountered in the hit-and-miss method previously employed in filing these bearing spools—nails were hammered around the periphery of the spools into a block of wood, and the machinist would file the bearing, attempting to hold the spool in place by hand.

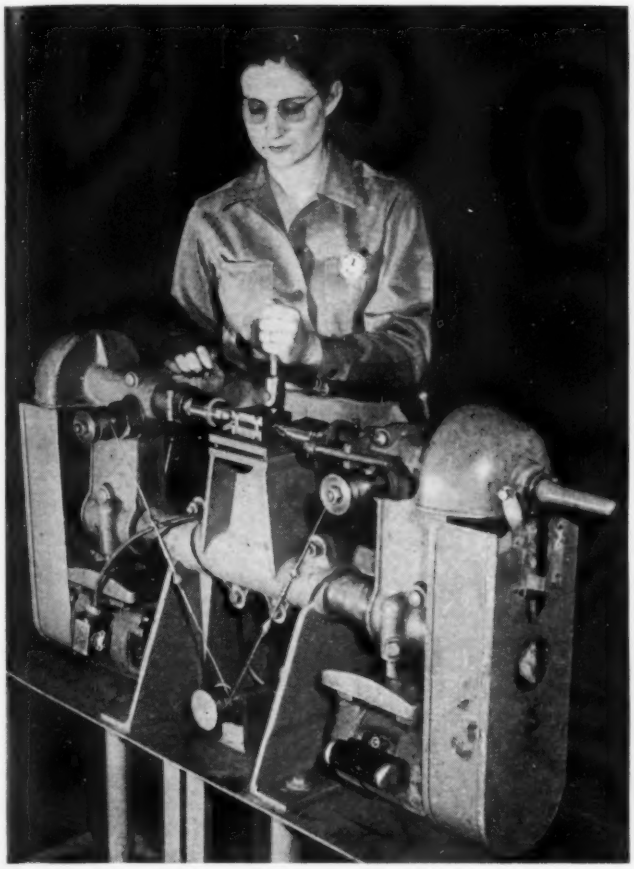
The vise shown in the drawing eliminates that practice. It holds the spool in place by a setscrew tapped into a ring, the circumference of which is slightly larger than that of the spool but snug enough to permit easy and firm adjustment of the setscrew. The ring is welded to a flat bar which has a hole drilled at the handle end. This hole is as large as the hole in the lower half of the bearing housing. A nut and bolt are then placed through both these holes and fastened until the vise is firm and rigid enough to withstand filing pressure. *Suggested by N. C. Elza, Bethlehem-Fairfield Shipyard, Incorporated.*

Progress on the Plains

Another myth is exploded—the idea that mechanical craftsmanship is confined to a few industrial areas. The Texas plains, heretofore famous only for cow punchers and coyotes, now blossom with new factories. The workers, recently trained to their jobs, are not satisfied merely to go through the motions of machine operation. Better methods have been devised to improve plant efficiency. Here are some of the new kinks now being used at the Dallas, Texas, plant of North American Aviation, Inc. Midwest and New England plants take notice.

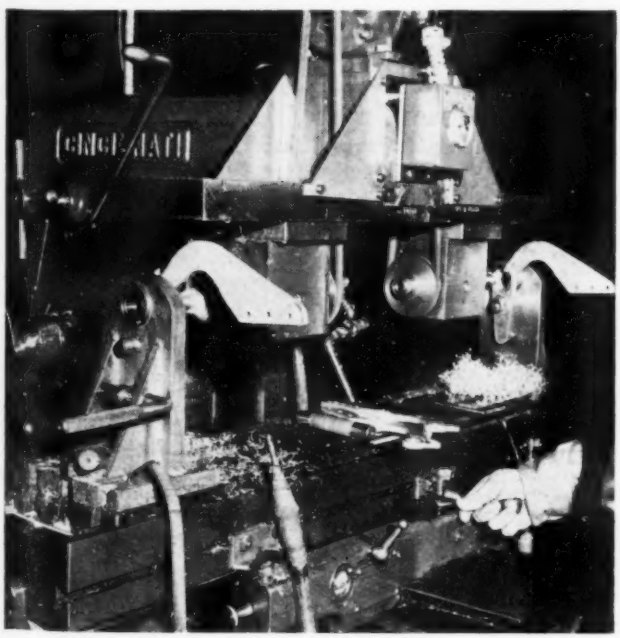


Continuously moving airplane assembly lines involve the problem of providing suitable connections for portable tools. If the line moves beyond the length of the connecting wire, the assembler has to halt in the middle of his work to plug into an outlet further down the line. A good solution lies in the use of overhead trolleys to carry the tools and bus bars to which they can be connected by sliding contacts. The set-up for the final assembly line on the AT6 trainer plane provides two such trolleys paralleling each side of the line. The trolleys carry holsters to store the electric tools out of the way when not in use. Air lines with a liberal number of outlet valves run above the trolley lines to serve rivet guns



A special centering machine for trim tab screws, is formed by setting up two Walker-Turner drilling machine heads in a horizontal position. The workpieces are held in a simple fixture provided with an eccentric clamp. Pulleys are mounted on the feed shafts and are connected by means of wire cables to a common pulley shaft between the two heads. Turning a handwheel on this shaft feeds both heads at once. The centers thus formed are used in turning and thread milling these parts, insuring concentricity between the turned and threaded surfaces

Aircraft machine shops have, until recently, been organized on a job-shop basis with lathes, milling machines, drilling machines and other types of machine tools, segregated into their own departments. Increased production has led to line machining certain parts, as well as line assembly. For instance, a separate department now works entirely on three landing gear parts: the oleo knuckle, the lock forging and the landing gear casting. Illustrated is part of the set-up for drilling 100 holes in the landing gear casting. The drill jig bearing this part is moved through five machines conveniently arranged in U formation. Formerly this part traveled two miles around the shop under the supervision of many different foremen. Now one foreman is responsible for the three parts. Since the department was set up no work has been spoiled in machining. Inspection is an integral part of the department. Sixteen machines were replaced by the present equipment.



To relieve overworked precision boring machines, a special head has been designed to fit a Cincinnati No. 2 milling machine. It is driven by a 1-hp. 3,400 r.p.m. motor geared down to 1,700 r.p.m. on the cutter arbors which are mounted in ball bearings. The head is double-ended so one job can be set up while another is under cut. Reinforcing gussets at both ends prevent the cross plate from springing when the head is clamped to the milling machine over-arm. Holes up to 1½ in. can be bored with this attachment. The job illustrated is the rear stick socket

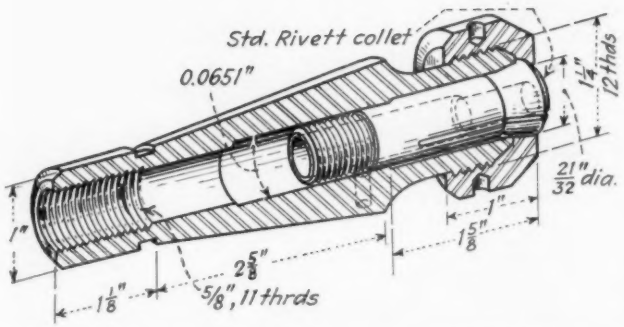
IDEAS FROM PRACTICAL MEN

Collet Adaptor for Small End Mills

BY S. P. CALDWELL

We have experienced difficulty in milling ordnance items to precise limits with small end mills because of variation in shank diameters. Where tolerances are close, a variation of 0.001 or 0.002 in. between shanks of replacement mills very often spells the difference between any good and rejected part. This is particularly true when using adaptors having fixed holes and setscrews to hold the mills in place.

To overcome this condition we recently made several milling adaptors to the design shown in the drawing. They are simple to make and they take standard collets. The adaptor is held in the miller similarly to an arbor, using a draw-in bar. The collet holds the end mill concentric.



Variation in shank diameters of replacement end mills often make it difficult to hold work to close tolerances. This can be overcome by using a collet adaptor

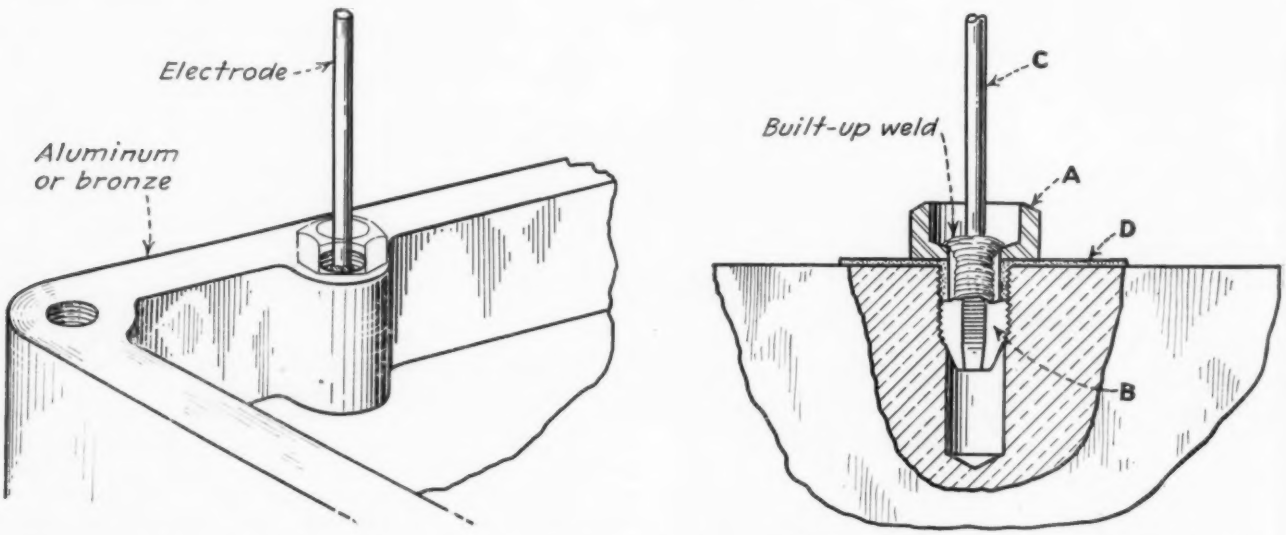
Employs Welding To Remove Broken Taps

BY ARTHUR J. LAVALLEE

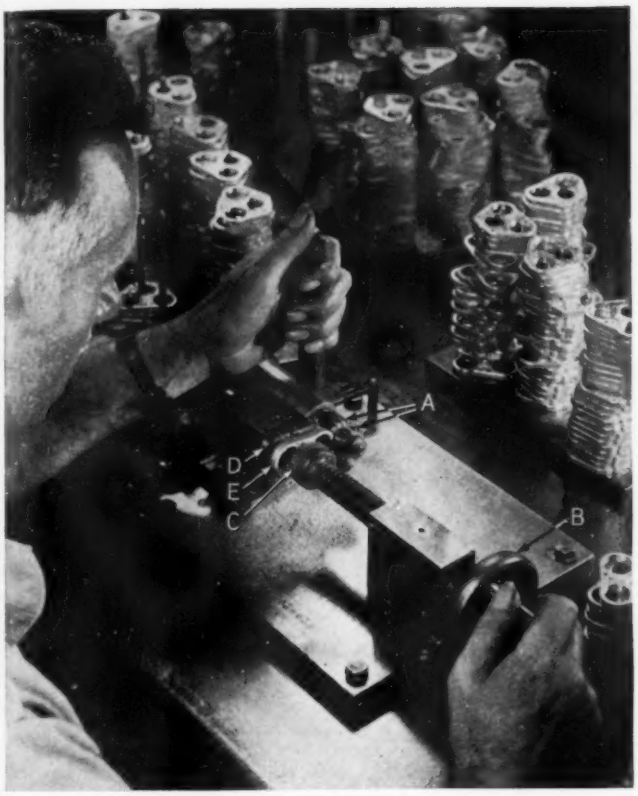
The following method is used with success by the Gilbert & Barker Manufacturing Company, West Springfield, Mass., to remove broken taps, studs and drills from aluminum and bronze castings. Take a hexagonal or square nut *A* of smaller size than the hole or tap size of the broken stud or tool *B*, and drill it two-thirds of the way through with a drill larger than the hole size. This leaves a shoulder at the bottom of the nut. Blow loose chips and foreign material from the hole, and if desired wash it with carbon tetrachloride or other cleaning solution.

Place nut *A* over the hole and with No. 7 electrode *C* arc weld the broken tool to the nut. Apply a wrench to the nut while it is still warm and back it off. Oil can be used to aid removal from bronze castings; however, a solution of soda ash and water is recommended when the casting is aluminum. The broken tool will turn easily and can be removed without damage to castings in the final stages of fabrication.

When the broken tool or stud is deeper than $\frac{1}{8}$ in. in the casting, a protective material *D*, such as powdered paste or sheet asbestos, should be applied between the nut and the casting. For tools broken within $\frac{1}{8}$ in. or less of the casting surface, no protection is required if care is exercised when welding them to the nuts.



Broken taps, drills and studs can be removed easily from aluminum and bronze castings by welding the broken tool to a nut, which then can be backed off



The cam follower on this burring machine is mounted on the cutter spindle. The part to be burred is held by friction against the cam, and is rotated by hand

Burrs Machined From Small Castings

BY VICTOR S. VOIGHT
Westinghouse Electric & Manufacturing Company

A simple machine can be built to remove burrs from the periphery of small aluminum castings after they have been machined. The burring cutters *A* are motor driven and are so mounted on the spindle that one cutter is constantly kept against one edge of the casting, which is rotated by handwheel *B*. Friction pad *C* engages the casting for rotating, and the turning motion of the casting follows cam *D* of the same shape. This brings all points on the periphery of part *E* against the cutter with the same amount of pressure so that the outline of the part is not destroyed. The machine is more effective for burr removal than an emery wheel or a file.

Index Jig Speeds Radial Drill Work

BY FRED PFEIFFER
General Electric Company

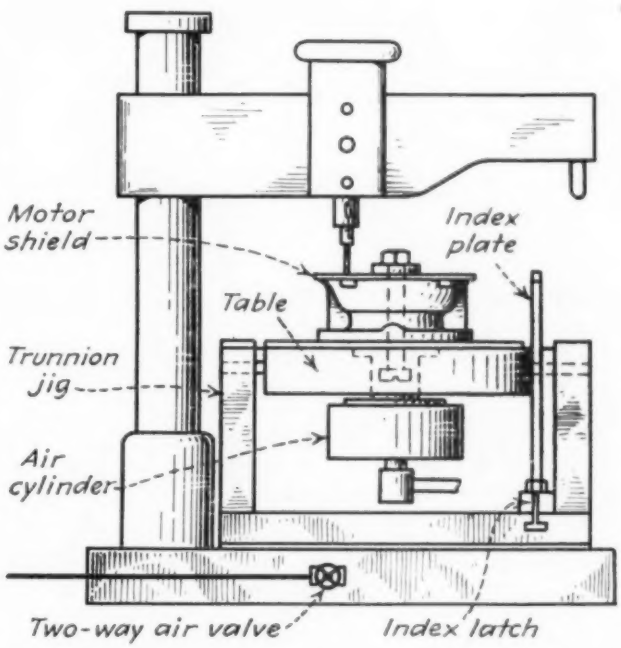
Drilling and tapping a variety of motor end shields on a radial drill press was taking considerable time and was rapidly developing into a production bottleneck. Most of these end shields require from four to eight holes in one side for mounting on the stator frame, and an equal number on the flange end for mounting on the customer's apparatus. Also, from one to four holes have to be drilled radially into the bearing housing for grease, oil and drain fittings.

These end shields are generally bolted to the top of the standard drill press table for drilling and tapping the flange holes, and then vertically on the front of the table for the radial holes. This latter operation takes most of the time, due to the weight of the castings and the accuracy of hole alignment required. Because of the small quantity and the large variety in sizes and design, drill jigs cannot be built economically for each end shield. Therefore the following set-up was devised.

A discarded trunion jig used previously in mass production drilling of motor frames on multiple drill presses was remodeled by removing the center trunion. One side of the remaining frame was machined parallel with the base and fitted with a steel plate 1 in. thick—this assembly serves as the table top. A 5-in. hole was bored in the center of the plate to meet a double-action 12-in. air cylinder, which is mounted on the jig by means of a threaded double-flange adaptor. One end of the main frame of the jig carries an indexing plate mounted on the trunnion shaft so as to be concentric with the trunnion.

In laying out the radial holes on the end shields, the centerlines of the holes are scribed over both sides of the flange ends. All the drill press operator has to do in chucking the end shield is to line up these lines with a deeply milled vertical centerline on the top of the table, place a U-strap across the top of the shield, insert an anchor bolt in the rectangular hole on the end of the piston rod, and apply the air pressure. A series of holes can then be drilled in the horizontal position. By indexing the table 90 deg., the radial holes can also be drilled, all in one clamping. The table can also be indexed anywhere from 0 to 90 deg. for drilling and tapping holes radially into the bearing housing for grease, oil and drain fittings.

This method of drilling and tapping the end shields has



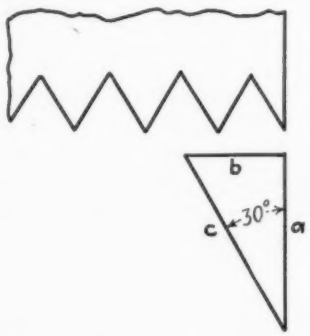
Motor end shields can be mounted on this trunion jig for drilling and tapping end holes, side holes and radial holes in the bearing housing. All work is done with one clamping, since the jig can be indexed to any position from 0 to 90 degrees

resulted in savings of 20 to 60 percent in direct labor, increased accuracy of the parts drilled, and greater safety in doing the work. Available ring jigs are often clamped together with the work, adding to the speed and accuracy with which drilling and tapping is done.

Multiple Threads Cut With The Compound

BY J. H. CODD

Square or acme multiple threads can be spaced by using the compound. Turn the compound at right angles to the cross-slide. After the compound is used to set the tool for thread depth, the tool is shifted a distance equal to the pitch of adjacent threads. This method works for any number of multiple threads. The change gears, of course, are set to cut the required lead.



With the base of this right triangle representing the pitch of multiple V-threads, sides *a* and *c*, respectively, represent cross-slide and compound movements for setting the tool

Multiple V-threads can also be cut accurately by a similar method with the compound set at 30 deg. The problem is to move the tool, lengthwise of the work, the distance of the pitch of adjacent threads. This is done by moving the cross-slide back and the compound forward. The drawing illustrates this movement: in this right triangle, the pitch of adjacent threads is represented by the base. The opposite angle, representing the setting of the compound, is 30 deg. The vertical side equals the cross-slide movement, and the hypotenuse equals the compound movement. After the actual pitch of the adjacent threads is determined in thousandths of an inch, the following procedure is used to cut the threads.

Set the change gears to cut the required lead.

Set the compound at 30 deg. to the cross-slide.

Screw the compound well back in its slide and set the dial at zero.

Move the cross-slide forward until the tool touches the work. Then set the dial at zero.

Using the compound as if cutting a single thread, set the depth of cut on the compound and cut a single thread to the finished depth. The tool is then moved to cut the next thread.

Reset the compound and cross-slide on zero as they were when the first thread was started.

Move the cross-slide back an amount equal to side *a*, which is 1.732 x pitch.

Move the compound forward an amount equal to side *c*, which is 2 x pitch. The tool is now in place for the next cut, just touching the work.

Set both the compound and cross-slide dials back to zero to avoid mistakes, and proceed to cut the second thread, using the compound.

This method has proved satisfactory in cutting accurate threads in any multiple.

Double-Thread Broach Burnishes Parts

BY HOWARD FANCHER

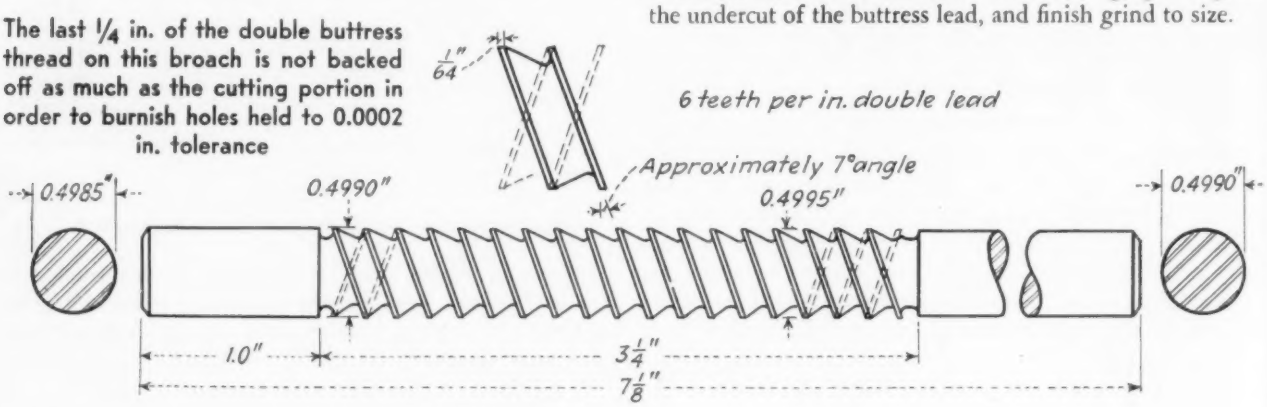
The broach shown in the drawing will finish holes within 0.0002 in. of being round and straight. It is being used to finish the bore in gear blanks and similar parts where the initial machining operation must be held to the stated tolerance to prevent magnification of error in subsequent machining. It is much shorter than the conventional broach and is used on a hand arbor press. Resharpening has been necessary only after 4,000 to 5,000 parts have been finished.

The broach was designed to finish the bore with a burnishing effect to within the 0.0002-in. tolerance after it had been rough broached 0.0005 in. under size. It is made of high-speed steel with a pilot 1 in. long, and the diameter of the broached hole. The double buttress thread is approximately 3 in. long, while the shank is long enough to push the buttress through the work. The diameter of the shank is the same as the diameter of the finished hole. The reaming portion has a taper of 0.0004 in. in 2½ in., and the last ½ in. is left the size of the finished hole. A good burnishing effect is obtained if the last ¼ in. is not backed off as much as the cutting part of the broach.

This design can be modified readily in accordance with the hole being broached and the material of the part. The smaller the diameter of the hole, the finer the thread that will be required. For example, eight threads per inch should be used for ¼-in. holes, whereas six threads per inch should be used for a ½-in. hole. A single thread with hardly any undercut should be used for brass, while a triple thread with as much undercut as possible should be used for aluminum.

The broach should be machined as follows: Rough turn and chase the buttress thread, harden and rough grind, grind the undercut of the buttress lead, and finish grind to size.

The last 1/4 in. of the double buttress thread on this broach is not backed off as much as the cutting portion in order to burnish holes held to 0.0002 in. tolerance



Armament

SECTION OF AMERICAN MACHINIST

Chrysler Builds the Bofors Gun

Built-up construction of the gun body poses many problems in fixture design and processing methods, because in addition to holding and guiding the gun barrel during recoil this subassembly provides mounting pads for the sights and arc-elevating mechanism

THE ENEMY HAS LEARNED to its sorrow on many fronts that America can produce the Bofors 40-mm. anti-aircraft gun in mass quantities. There is nothing particularly secret about the gun, since it was developed by a Swedish company that either sold the weapon or licensed its manufacture to a number of European countries, including England and Germany. The withdrawal from Dunkirk convinced the British that the 40-mm. AA gun is a potent destroyer of low-flying aircraft, and in order to step up production a contract was given in 1940 to a Canadian company. Barrel production methods developed by that concern have been described (*AM*—Vol. 84, page 1070).

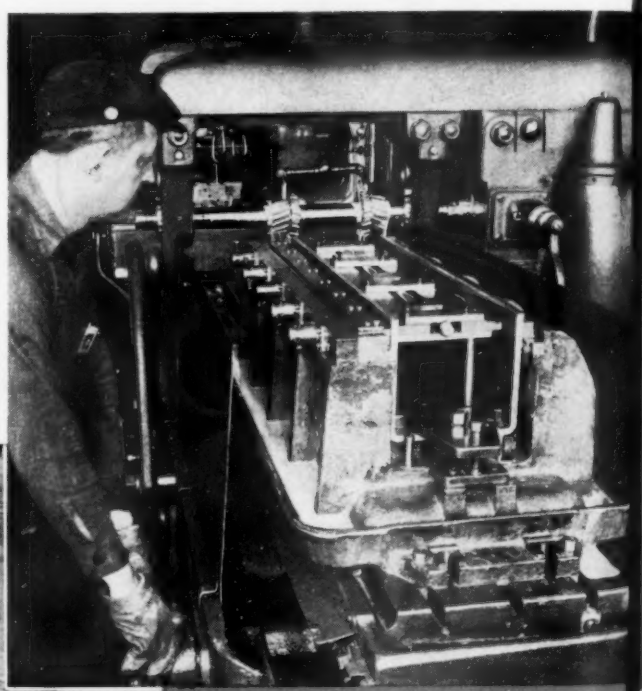
Up to that time, the Bofors was produced essentially by toolroom methods, as evidenced by the foreign blueprints received by the Chrysler Corporation on February 1, 1941, when the United States Government awarded a contract to make drawings to American standards and produce two sample guns. Forehandedness by the Navy in this matter paved the way for realization of Chrysler's current position in the manufacture of the Bofors—very likely the largest producer of this weapon in the world.

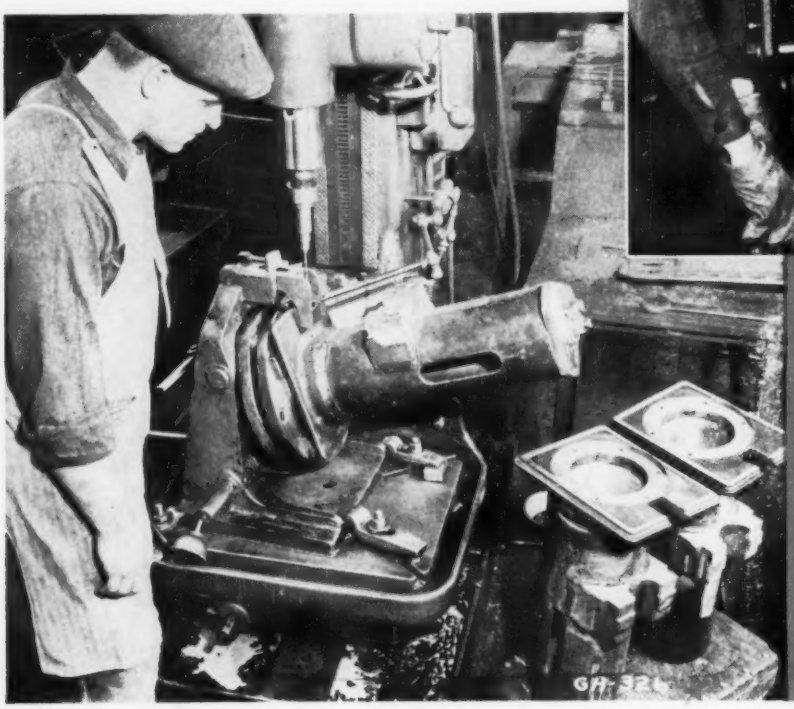
Designed the Hard Way

Attainment of mass production for a precision product containing more than 5,000 parts posed innumerable problems to the engineers, metallurgists and master mechanics who have worked as a team on the enterprise. According to the original drawings, hundreds of Bofors parts were seemingly designed to be made the most difficult way. For example, bar stock was specified for complex pieces, even though 90 percent of the metal was later machined away. The answer, of course, was to make these parts from forgings, for otherwise there would not be enough machinery or labor to handle the quantities involved.

To conserve alloys, steels were standardized. SAE 4340 and 4140, together with medium carbon steel, replaced numerous foreign analyses after adequate testing. Non-ferrous metals are saved by the metal spraying of bearing surfaces on steel back-up members, in place of solid bronze forgings. For substitutions of this kind, the full resources of the Chrysler Engineering and Production Laboratory have been brought to bear.

Five Chrysler plants—Chrysler, DeSoto, Dodge, Plymouth and Highland Park—have major responsibilities in respect to manufacture of 40-mm. AA gun parts and subassemblies; a sixth plant does the final assembly. Additional parts and minor subassemblies are produced by other Chrysler plants. Each of the "parts" plants op-

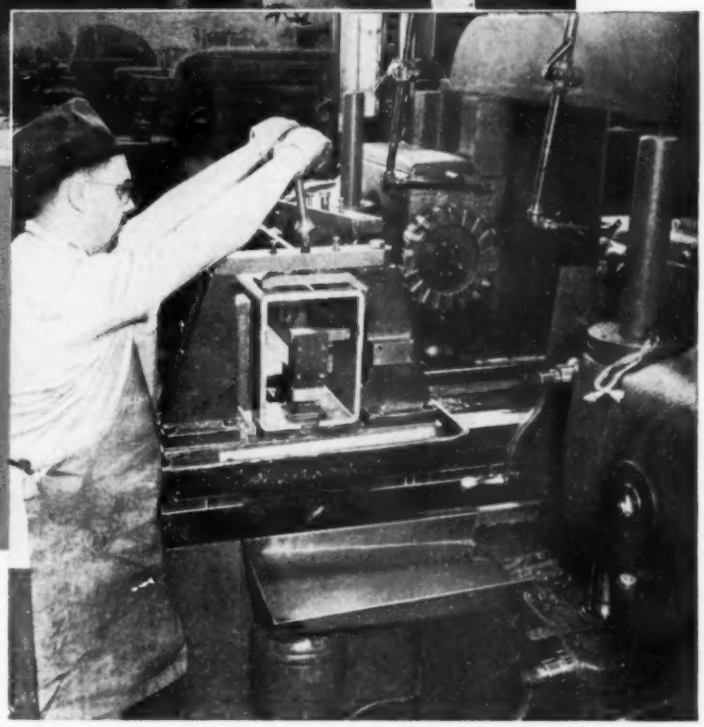




One of the first steps in producing the box-section casing of the gun body is to mill the legs of steel channel to height and provide a rabbet for the breech guides

One of the major product improvements in the gun body was achieved through welding a buffer block and a steel flange to a tube, in order to form the forepart shown in a drilling fixture

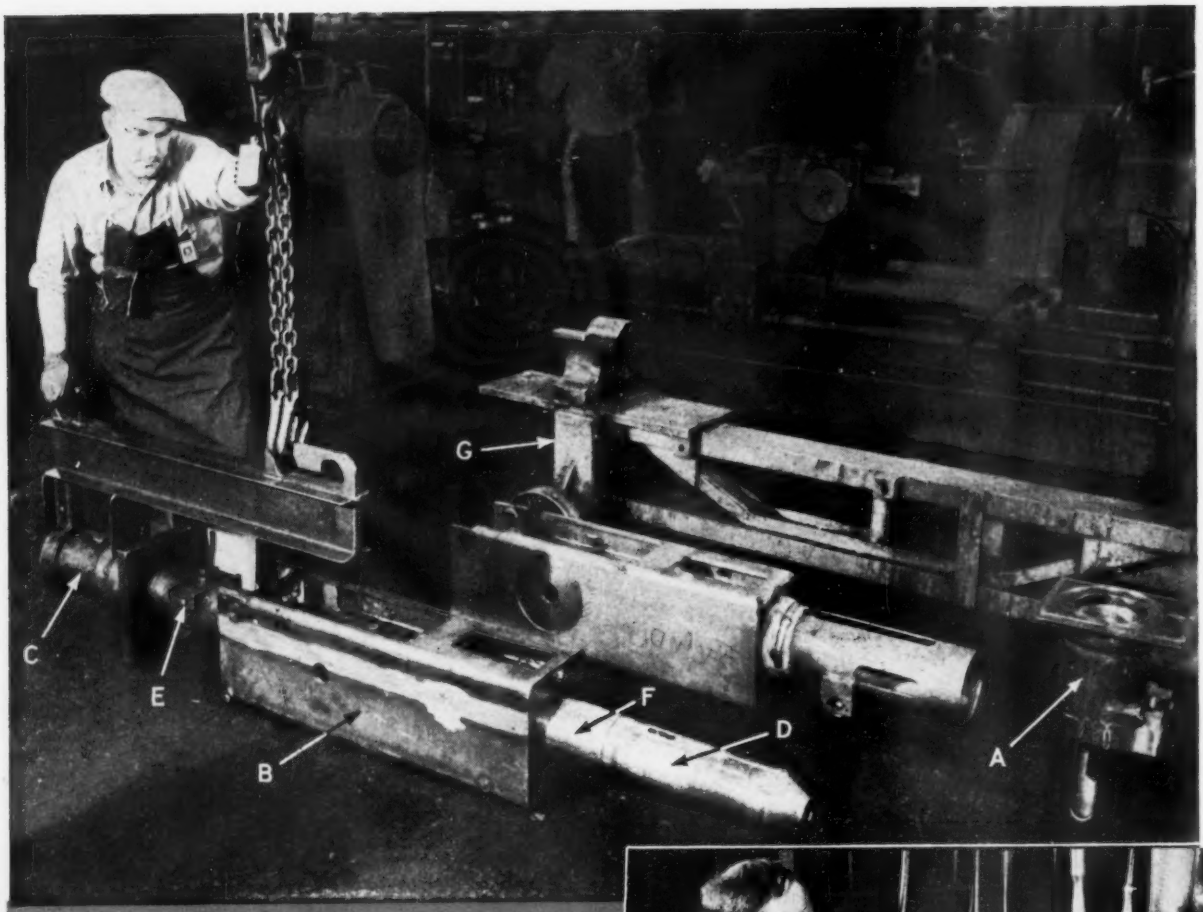
Two steel channels are arc welded together automatically to produce a box section, which is one of the main components of the gun body. Copper blocks *A*, clamped at the ends of the joint, insure a full bead at the ends of the joint



In straddle milling the ends of the casing to length upon a duplex mill, the fixture takes location from one end of the guides welded inside the part

erates to produce components and mechanisms that are inspected and tested to assemble with the products of the other plants with a minimum of hand fitting. In attaining interchangeable manufacture for a 5,000-part article, machines and processes have been developed, thousands of engineering changes have been initiated to save and simplify tools, speed production, reduce cost. How this program has been carried out is disclosed by details of manufacturing methods selected in the five major plants.

The gun body guides the barrel during recoil, connects the gun to its mount. The gun body also mounts the arc-elevating mechanism and the sights. To complicate the problem still further the assembly is a welded structure. Manufacturing limits tell the story: the external sight pad on the forepart must be held to half a thousandth with respect to the lapped guides *inside* the boxlike casing, or rear section; the honed bore in the forepart is held to a few thousandths with respect to the



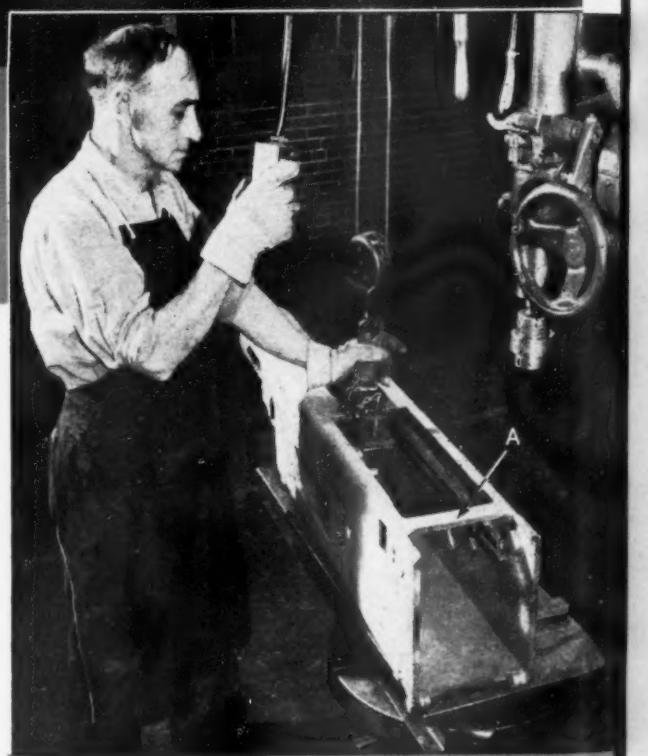
Assembly of the forepart *A* to the casing *B* for welding uses the counter-balanced yoke *C* and the arbor *D*. Two keys *E* in the arbor engage the breech guides in the casing while a shoulder *F* locates the bore of the forepart. The buggy *G* transports the assembly to a welding booth

guides; the trunnion bores in the casing are held even closer with respect to the guides: To attain these limits, 82 operations are required upon the gun body after the forepart is welded to the casing and the whole is normalized.

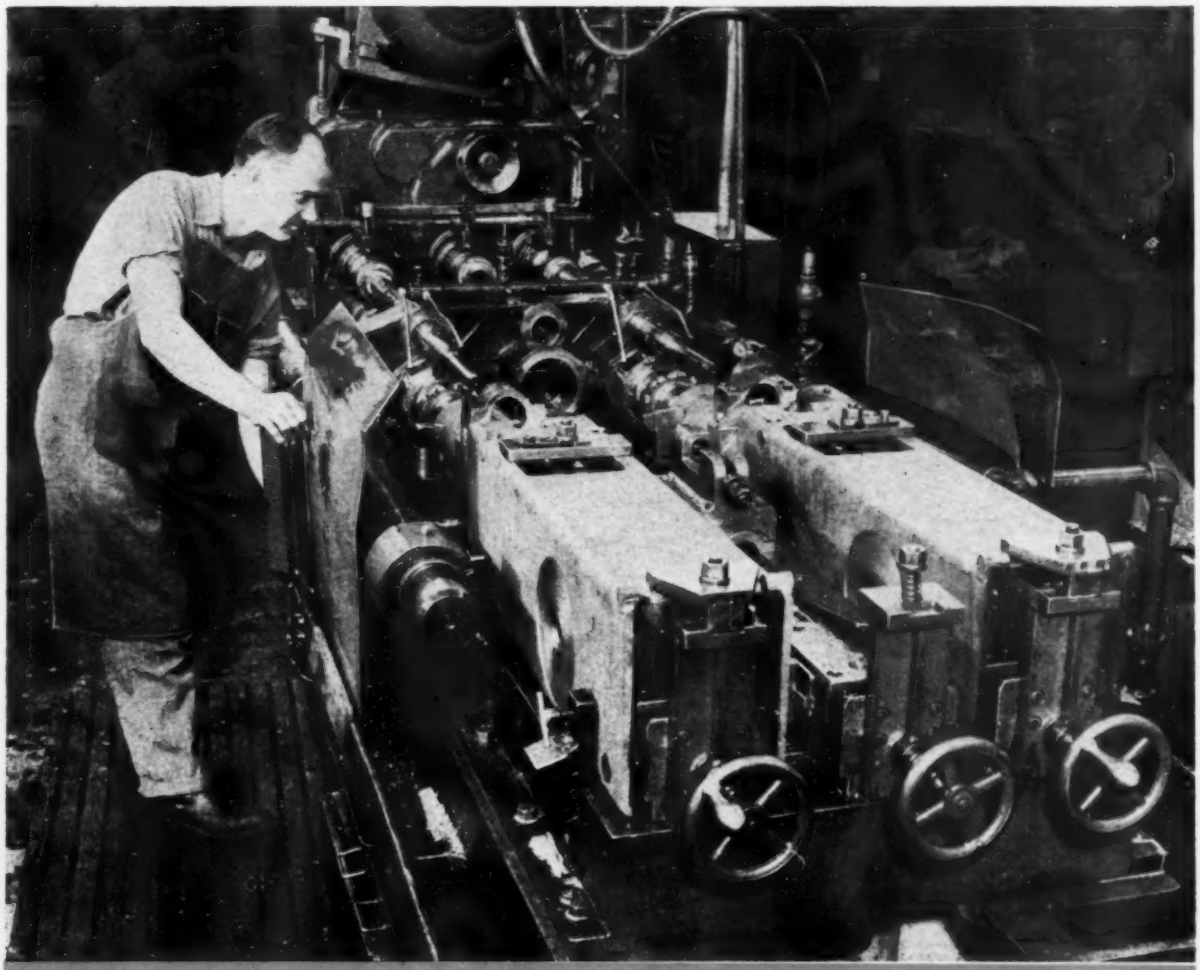
Welded Design Saves Material

The forepart of the gun body is currently a fabricated assembly, consisting of a steel tube to which the buffer bracket, sight pad and flange are arc-welded. Formerly a steel casting was used, but much extra metal was required in the part to avoid trouble with porosity, shrinks and other defects. To avoid scrap losses and burdensome machining, the design was changed to welded construction.

In welding the buffer block to the tube O.D., the part is bowed as much as 0.200 in.; average about $\frac{1}{8}$ in. Stress-relieving in box furnaces reduces the lengthwise curvature about 65 percent, and the component is then straightened.



During rough machining, strap *A* serves to hold the side walls of the casing from bulging out as the result of the flame-cut openings. The operator is preparing to drill dowel-pin holes in the casing so that a temporary bridge can replace the strap when setting up to finish machine the interior



This duplex precision-boring machine is designed to receive two single gun bodies (for the Army mount) or two bodies assembled together for the Navy mount. The main bore and the buffer hole in the forepart are precision bored with respect to the internal guides for the barrel breech

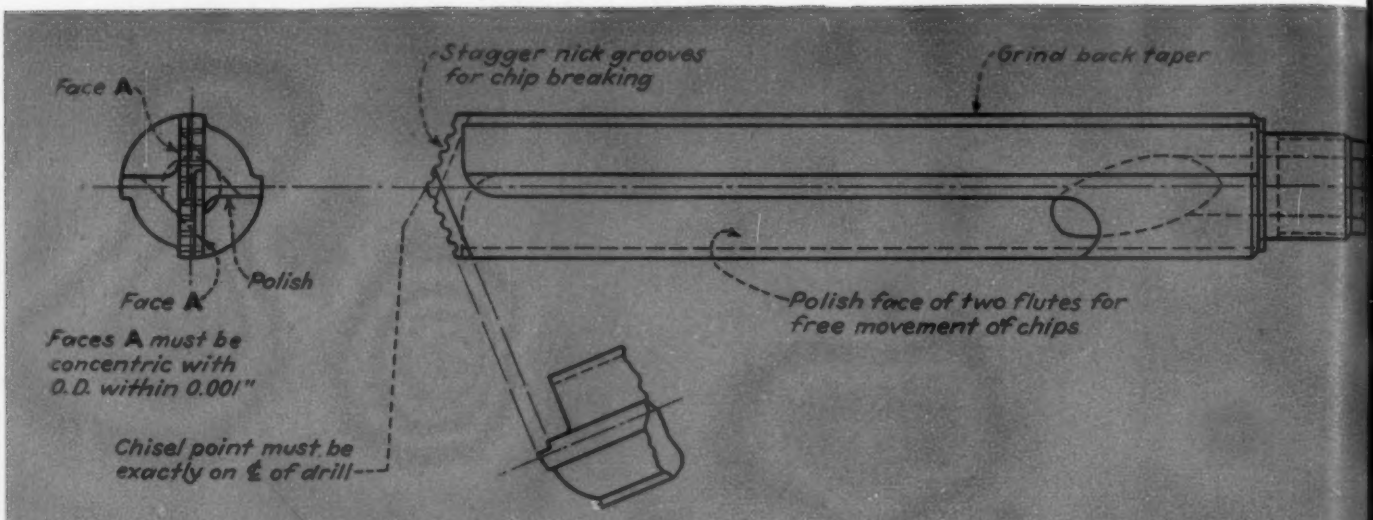
A pilot is turned on the tube, and the machined flange is assembled to it with a light press fit, then welded. The original turntable welding fixture was motor driven at constant speed. New equipment with a hydraulic motor drive gives the operator just the speed he needs at any point in the arc-welding process. An automatic arc welding head was also developed for this operation.

The casing is produced by welding two channels together. Prior to welding, the channel legs are milled to height and a rabbet machined on the inner edges to receive the barrel-guide strips. Channels are next rough straddle milled to length for location purposes in the tack-welding assembly fixture.

Assembly of the channels and guide strips by tack welding calls for a rigid fixture that takes location from the bottom of the box. The edges of the two channels are set about $\frac{1}{8}$ in. apart to permit a seam weld upon an automatic machine at a later operation. The channels are tackwelded together, and a removable positioner locates the guide strips in the rabbets for tackwelding.

Automatic arc welding is expedited by copper blocks clamped at both ends of the joint. Before these blocks were developed, it was necessary to weld steel tabs at both ends of the joint to promote a full bead to the end of the joint. Later these tabs had to be cut off and the ends of the box ground flush. Welding is done automatically. The operator's helper vacuums loose weld-protective material and chips the harder weld deposits. This material is returned to the supplier for re-use.

Subsequently, the flame cutting of door openings in the casing puts a weave in the assembly that does not affect gun quality but interferes with the use of the *sides* of the box for locating purposes during rough machining. A strap is therefore purposely left at one end of the top surface, so that the sides of the box do not open out to destroy guide alignment. Four locating pads are


Face A
Stagger nick grooves for chip breaking
Grind back taper
Polish
Face A
Faces A must be concentric with O.D. within 0.001"
Polish face of two flutes for free movement of chips
Chisel point must be exactly on ℄ of drill

A two-lip gun drill gives production three times faster than the conventional tool when drilling the hole through forged gun barrels

arc-welded to the casing bottom and one adjacent side.

The locating pads are rough milled to approximately $\frac{1}{16}$ in. of final height upon a trunnion-type fixture that takes location from the guides. The casing is then finish milled to length.

The manual effort required to assemble the forepart to the casing, is minimized by a Chrysler-designed fixture. This fixture has two main parts. An arbor with two keys is picked up by a yoke suspended from the hoist and is slid into the casing, the keys engaging the guides. Then the forepart of the gun body is slid over the protruding end of the arbor. A shoulder on the arbor forms a bearing for the machined bore in the flange of the forepart, which is locked in position against the casing by a tang. Finally the arbor with the assembly in place is lifted onto a wheeled buggy that has V-block supports, and the yoke is removed for further work. The buggy is rolled to a booth where the joint between the forepart and casing is arc welded.

To prevent distortion of the guides in the box section during normalizing, a spreader fixture is expanded into them. This fixture is left in the guide until the assembly has cooled to room temperature. Spreader fixtures are made from steel seasoned by at least a dozen normalizing treatments. After sandblasting, the heat-treated gun body is straightened prior to 82 finish-machining operations.

Bridge Holds Body During Set-Ups

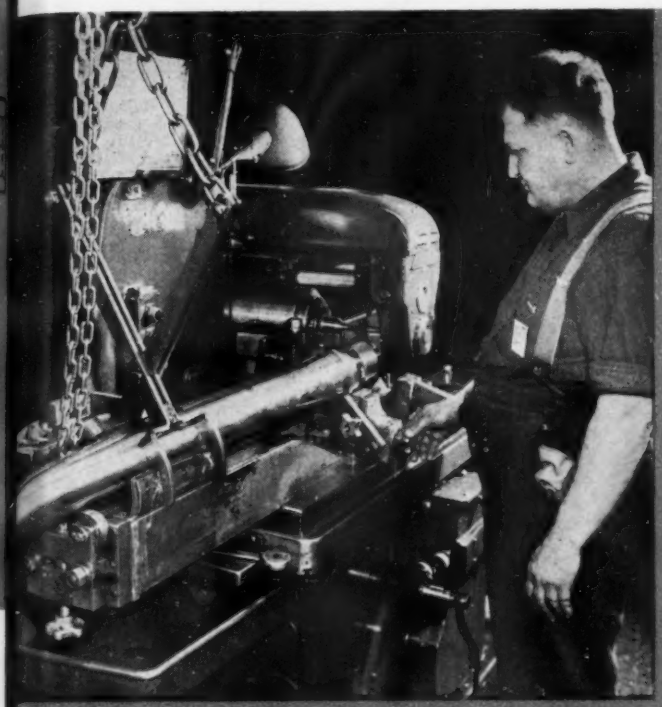
In the finished gun body, the top surface of the box section is almost entirely cut out for a door. During the flame-cutting operation, a narrow strap was left at one end to prevent the sides of the box from opening out and destroying parallelism of the guides. It is now essential to remove the strap to permit milling the box section's interior, but still provide a means of holding the sides of the box parallel. Two dowel holes are therefore drilled and reamed just outside the points where the strap is subsequently milled out. A temporary bridge with two dowel pins is then inserted in the holes to hold the sides of the box in the original position while setting up the assembly in succeeding operations.

The locating pads on the exterior of the gun body are next finish milled, the fixture taking location from the guides. The latest equipment installed for this operation consists of a two-head milling machine, one head on the cross-rail and one side head on a column, so that the pads on the two adjacent sides of the box section can be milled without indexing the part.

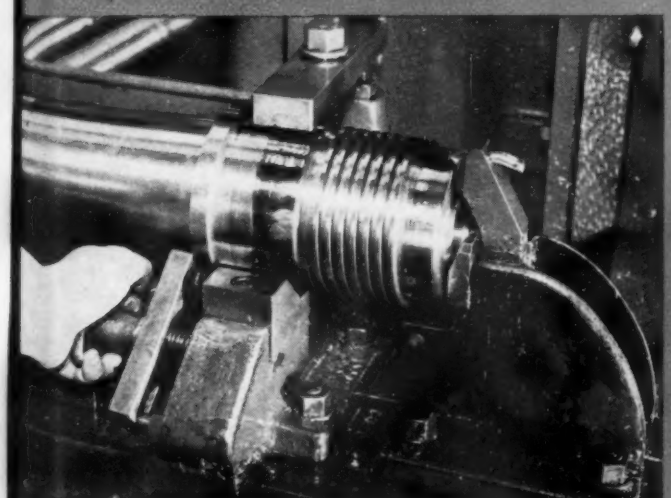
The finished locating pads now serve to position the part for semi-finish and finish milling the guides in two operations. In setting up the gun body in the fixture, the temporary bridge is left in place until side members of the fixture are clamped to hold the sides of the box. In a number of succeeding operations, the finished guides serve as the locating points, and the temporary bridge is employed until the piece is securely clamped in the fixture.

After a number of detail milling operations, the buffer bracket cap is assembled to the gun body. To precision bore the buffer hole and the forepart bore in relation to the guides, the assembly is set up in a duplex horizontal boring machine fitted with four spindles. Here again the fixtures locate from the guides. But after precision boring the trunnion holes in the sides of the box section, the bore in the forepart and the two trunnion holes are employed for three-point location in subsequent fixtures.

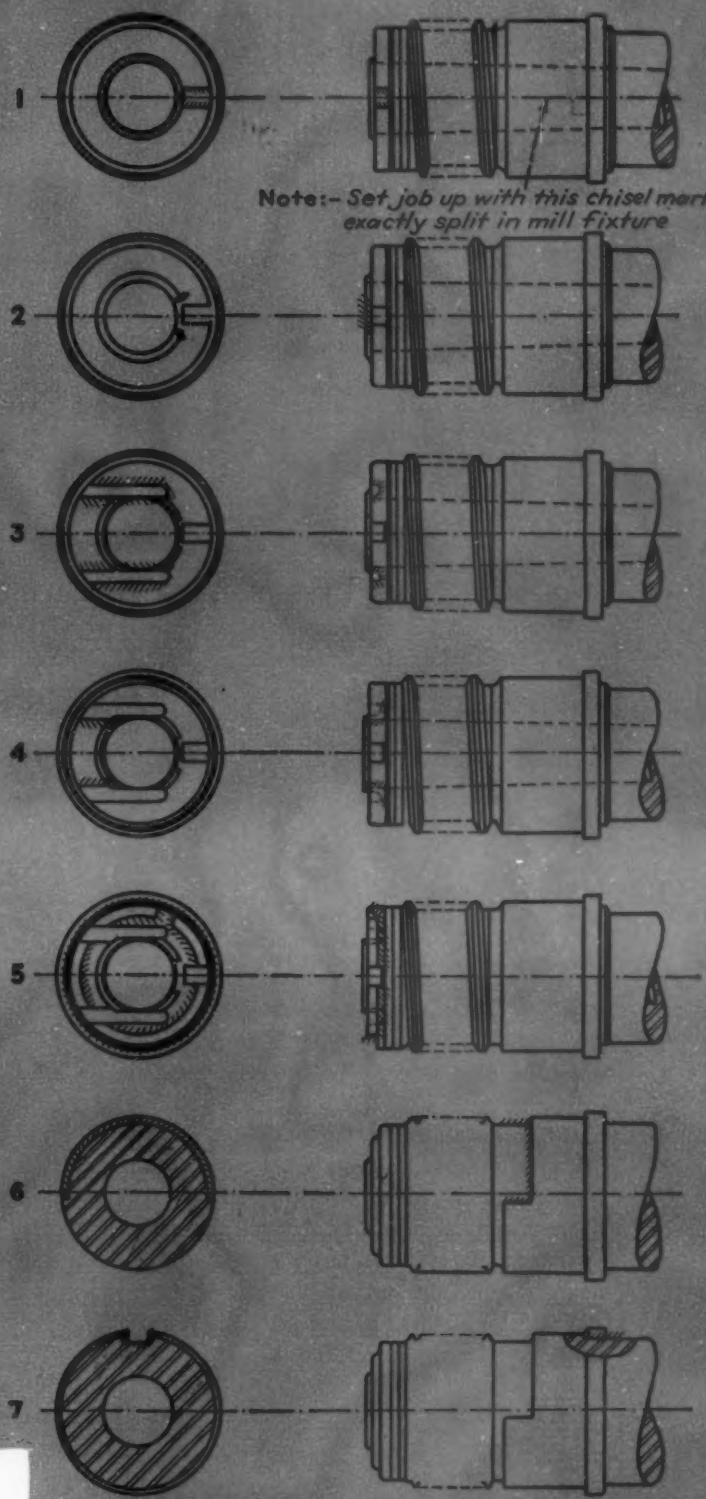
Literally acres of floorspace are devoted in another Chrysler plant to machining barrels for 40-mm.



First milling operation in the breech end of the barrel involves milling the lock slot. A crab-type lift (on a monorail system) facilitates placing the barrel in the fixture and transferring the piece to the next machine



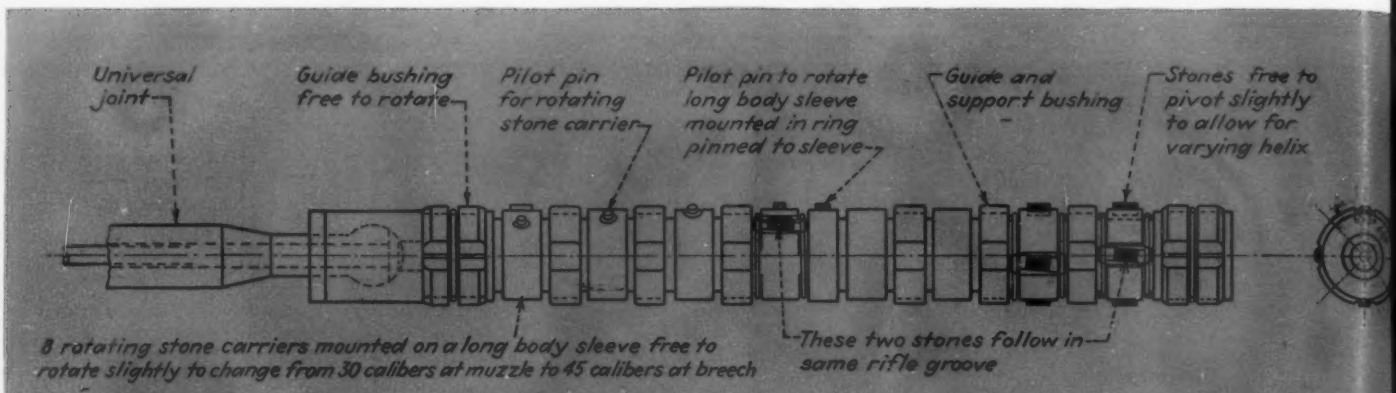
To mill a wider slot concentric with the lock slot, a swing-up gage pawl is entered in the lock slot before clamping the barrel



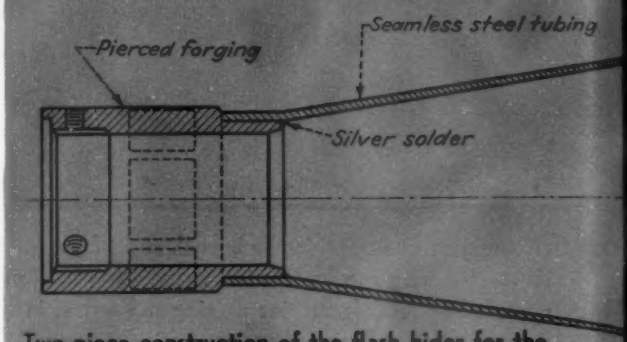
Milling operations on the breech end of the barrel are split into seven set-ups, instead of one, in order to speed production. The lock slot, operation No. 1, serves as the locating point in subsequent set-ups

AA guns. Material is received from four sources: two forging plants, one centrifugal casting plant, and a concern that upsets heavy-wall pierced tubing. Since all four products are heat-treated to the same physical properties, the machinability is uniform.

Forged barrels are drilled with a two-lip tool that


Universal joint
Guide bushing free to rotate
Pilot pin for rotating stone carrier
Pilot pin to rotate long body sleeve mounted in ring pinned to sleeve
Guide and support bushing
Stones free to pivot slightly to allow for varying helix
8 rotating stone carriers mounted on a long body sleeve free to rotate slightly to change from 30 calibers at muzzle to 45 calibers at breech
These two stones follow in same rifle groove

Because the helix angle of rifling in the Bofors barrel is not constant, the rifling hone is fitted with stone carriers free to rotate slightly and with stones that pivot with the change in helix angle



Two-piece construction of the flash hider for the muzzle saves removal of almost 30 lb. of metal per assembly and 4,893 man-hours per month. The bell-mouthed part is die-formed from seamless tubing; the nut is machined from a forging

gives production three times faster than a conventional gun drill. It is essential that the lips be ground precisely to the proper angle, and with the point coinciding with the centerline of the tool.

Up to the point of milling the breech end, barrel production methods are generally similar to practices described in these pages. But the breech milling operations have been simplified, so that they can be done in sequence upon a battery of rise and fall milling machines instead of being handled in one lengthy set-up on a special-purpose unit. The Chrysler method permits the use of less skilled men, or even women, for this work.

Breech End Operations

After the first operation, which mills the lock slot with respect to the datum line, all subsequent fixtures use the lock slot for location purposes. This tool-engineering concept permits comparatively simple fixtures, reduces set-up time, speeds production. The operations are:

1. Mill the lock slot on a rise and fall miller. The barrel is supported at the middle and muzzle end by rollers, the breech end by a semi-circular locating plate bearing against the principal diameter. The end of the breech is set aaginst a locating shoulder in the fixture. Next an alignment gage is screwed onto the fixture. By placing a scriber against the alignment gage, and rotating the barrel until the scriber splits the chiseled datum line, the part is positioned properly with respect to the cutter. After clamping the barrel, the alignment is rechecked before taking the cut.

2. A somewhat wider slot must be milled concentric with the lock slot in a succeeding set-up. A swing-up gaging member is entered in the lock slot, the clamps are applied, the locating bar is disengaged, and the automatic milling cycle is started.

3. For milling the two extractor slots in the end face of the breech, the barrel is positioned in the fixture so that a locating key in the fixture bed engages the lock slot.

4. The sides of the extractor slot are end-milled in another set-up of the same character.

5. For cam milling the breech end, the barrel is chucked in a power-driven workhead, being set up so that a retractable locating plunger engages the lock slot. After feeding the cutter to depth by hand, and checking with a flush-pin gage, the automatic feed is engaged. In this operation, the form cutter not only mills the cam but also a radius at the edge to avoid a filing operation.

6. Milling the relief on the abutment lock requires perhaps the most skill in the sequence of operations on the breech. A hand-operated plunger again enters the lock slot to establish the start of the cut with respect to the datum line, but the operator must control his cut between two lines scribed circumferentially. Power feed is applied to the workhead to rough out the stock, but finishing of the floor is done by hand.

7. As the last operation, a slot for holding the

To control distortion, speed production and save machine-tool installations, a Chrysler plant conceived the idea of making curved loader rods by turning a ring on a boring mill, cutting it into seqments

water jacket in place is milled in relation to the lock slot, using a gaging pawl to locate the barrel.

Chatter is not entirely avoidable when broaching the rifling grooves, because of slight irregularities in material. Usually, such surface imperfections are not more than 0.0005 in. deep and they are not of sufficient importance to cause rejection. On the other hand, in common with other manufacturers, Chrysler is endeavoring to provide the highest quality in fighting materiel. Hence honing of the rifling grooves is employed for those barrels which production inspection feels might be improved.

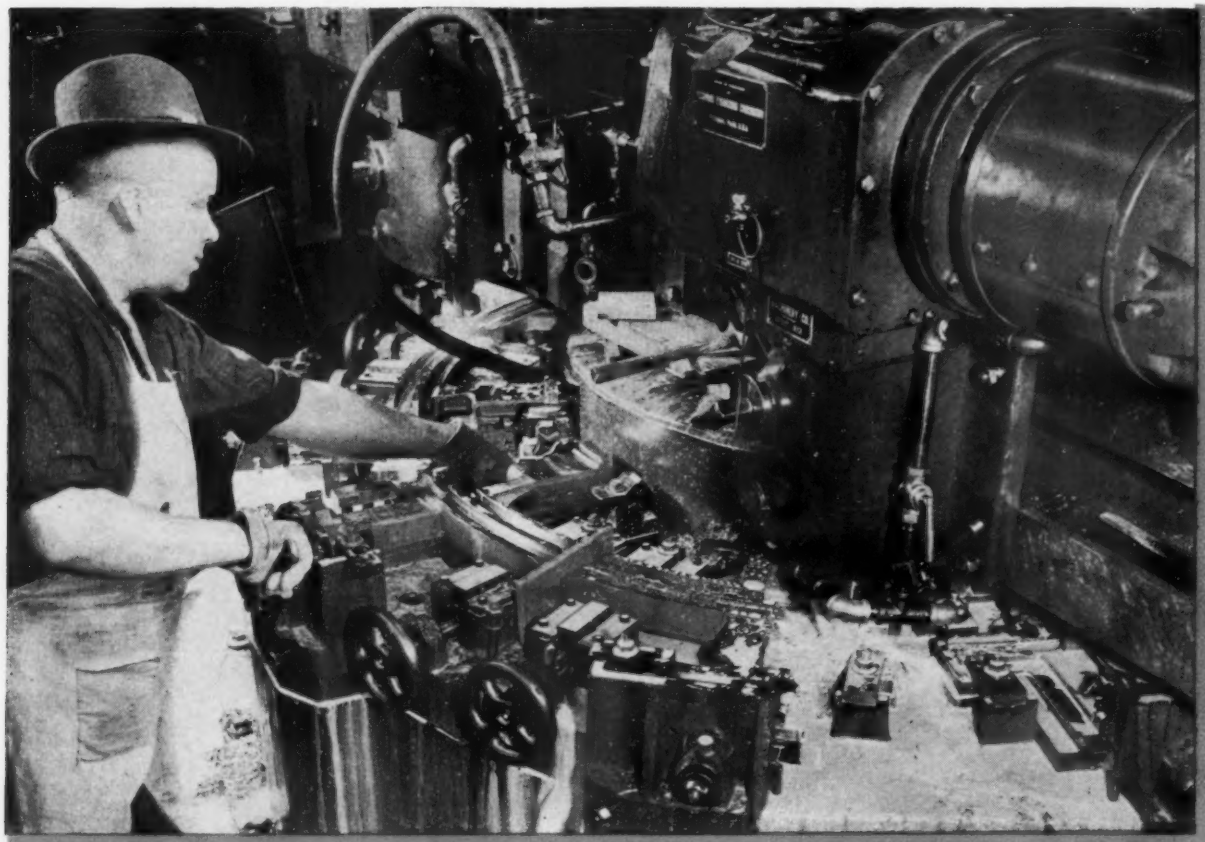
The honing of rifling has been done elsewhere, but always so far as known for barrels in which the rifling has a constant helix angle. The 40-mm. AA gun, however, has rifling in which the helix angle becomes progressively steeper between the breach and muzzle ends. This circumstance required the design of a special honing tool.

The plant producing barrels is also charged with making a number of small parts. In many cases, the original specifications called for the use of bar stock, but the complex contours and large amounts of metal to be removed seriously interfered with mass production. Hence, forgings were substituted for a number of these parts. For other components, development programs have leaned heavily upon experience gained in automotive-parts production. One of these projects involved the simplification of manufacture for the flash hider, a bell-mouthed assembly that is screwed onto the muzzle end of the gun to conceal the powder flash.

Tubing Replaces Forging

Originally this flash hider was machined from a solid steel forging weighing 40 lb., the finished weight being 10 lb. Before tooling, Chrysler engineers changed the design to a pierced forging, to remove some of the excess stock. The pierced forging still presented difficult machining. Complicated fixtures and critical machine tools were required.

It was reasoned that the bell-mouthed portion of the flash hider could be produced in simple press tools



Multiple-spindle heads mounted on the rail of a former cylinder-block rotary mill machine fourteen surfaces on the inner side of the loader side frame. Table rotation establishes the radii of the various cuts, taken with the work located at the correct distance from the center of rotation

in one operation, in which one end of the tube would be swaged down by the die ring and the other end flared by the punch. By an odd circumstance, the first try, using 4 in. tube, was successful, one end being swaged down to $2\frac{7}{8}$ in. and the other end flared to $5\frac{1}{8}$ in. Moreover, the proper tapering thickness was obtained throughout the bell mouth.

The nut portion of the flash hider is now produced from a pierced forging, removing only $1\frac{1}{2}$ lb. of metal. The tapered end of the bell-shaped piece is cleaned up for a silver-solder joint. The two parts are assembled, then placed in an induction coil to raise the joint to 1175 F. for silver soldering. This process does not scale or distort the work. Besides possessing adequate strength, the silver-soldered joint is moisture proof, because the solder completely fills the space between the two parts.

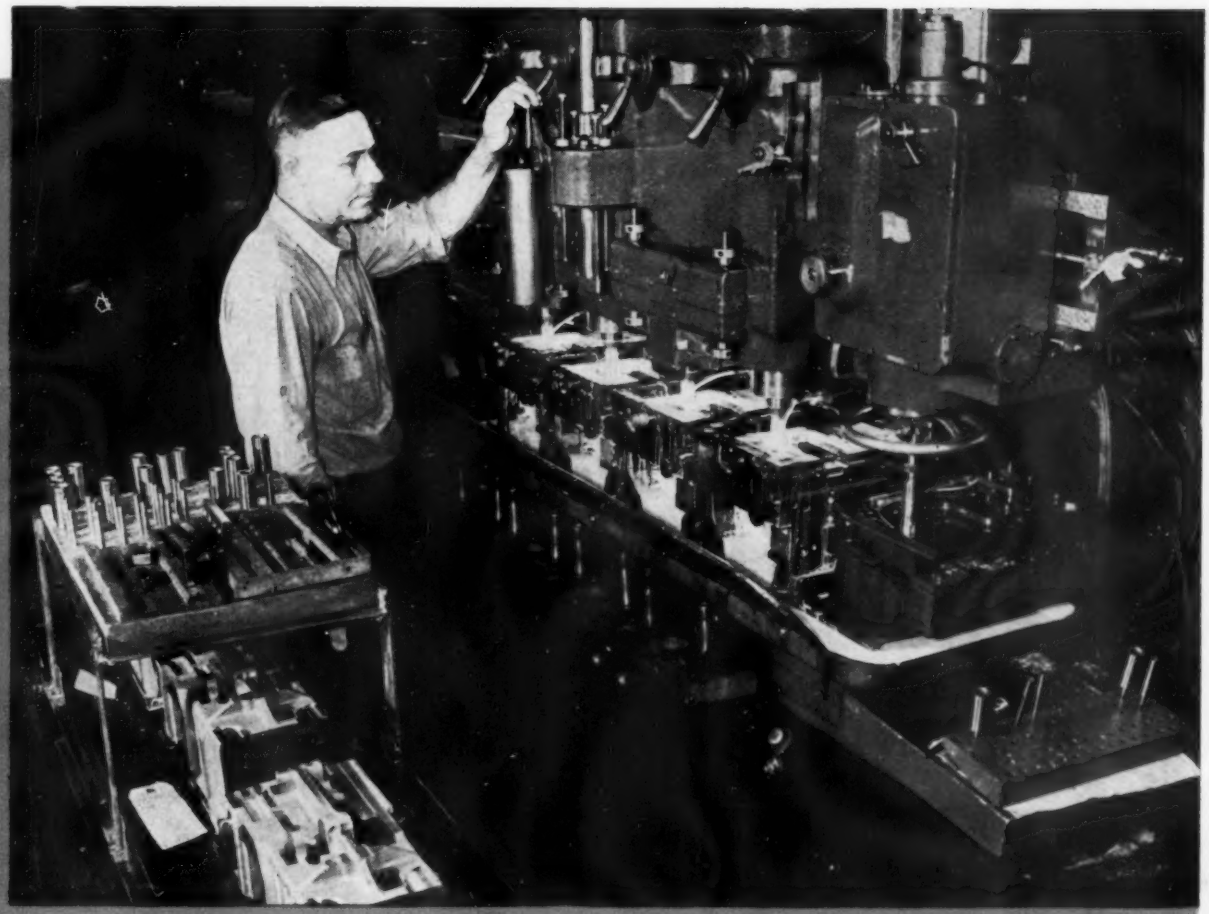
Many tons of steel are saved per month by the new design of flash hider. Six machines of a critical nature were re-assigned to other work, and nine machines were not ordered when gun quotas were increased. Some 4,893 man-hours, or an equivalent number of machine-hours, are saved each month by the application of automotive "know-how" to manufacture of a single Bofors part.

Another Chrysler plant produces the automatic loader mechanism to standards of accuracy which permit ready installation in the gun at the final assembly plant. Application of tool engineering to hundreds of detail operations on the mechanism's parts has reduced hand fitting to less than 5 percent of that originally required, increased output, cut costs, improved quality.

Standard Fillets Save Cutters

As in all gun work, milling is the predominant operation, and hence considerable thought has been applied to cut machining time and make the job easier within the limits of proper functioning of the weapon. Wherever practical, inserted-blade cutters with mild-steel holders have superseded solid high-speed steel cutters so that broken teeth can be replaced and tool life prolonged.

Many different radii were specified upon the original part drawings. In numerous instances, with the ap-



Four-spindle automatic profilers are used in large numbers by a Chrysler plant for milling pockets, contours, windows and ledges in several components of the Bofors loader mechanism. Here, by means of stacked templets, four operations are performed upon the loader base to avoid relocation errors

proval of the Navy Department, plain angular sides were substituted so that ordinary side mills can be used, to avoid tool procurement delays and grinding difficulties. Fillets and radii were standardized for two reasons: (1) to reduce the number of cutter changes required to machine a particular group of surfaces in a given set-up, and (2) to reduce the number of cutters differing only in corner radii.

Production requirements on some operations caused the tool-engineering group to specify methods that set themselves apart in the routine of a large production machine shop. Steel loader rods, for example, are channel-shaped pieces which are segments of a large circle. The original specification called for manufacture from individual forgings, thereby involving trouble with distortion during machining.

The Chrysler plant decided to roll a bar of steel into a ring, butt weld the ends, turn the ring on a boring mill and cut the ring into 14 or 20 segments, for rear and front guide rods respectively. This method is entirely satisfactory when the ring is made of heat-treated stock and the butt-welded ring is carefully normalized before machining. No allowance is required for springback after sawing the segments apart.

The ring is turned in two boring-mill set-ups. In the first operation the internal diameter of the ring and the bottom surface are rough and finish turned. For the second set-up, the part is transferred to another boring mill and the ring is laid with the finished bottom surface down on a table fixture. Clamps are positioned against the finish-turned I.D., being careful to indicate the part to 0.001 in. before rough and finish turning the O.D. Additional clamps are then brought to bear on the finished O.D. while semi-finishing the sides and floor of the channel section. Finishing the sides down to the floor follows. Clamps are then removed to finish the over-all height of the piece and the floor of the channel.

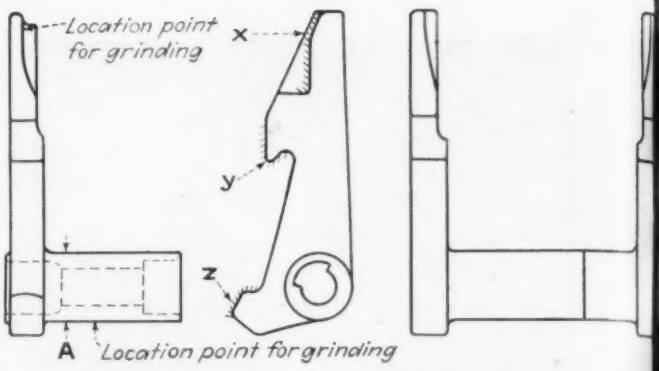
For sawing the ring into segments, a special fixture was built and set up in conjunction with a metal-cutting bandsaw retrieved from automotive plant equipment. Two quick-acting clamps are provided per segment. Location of the ring is taken from the channel

slot which fits over a mating ring in the fixture. To make each cut, the operator merely engages in a hand-operated detent with a notched gaging plate affixed to the fixture bed and traverses the saw to the cut with a hand-wheel.

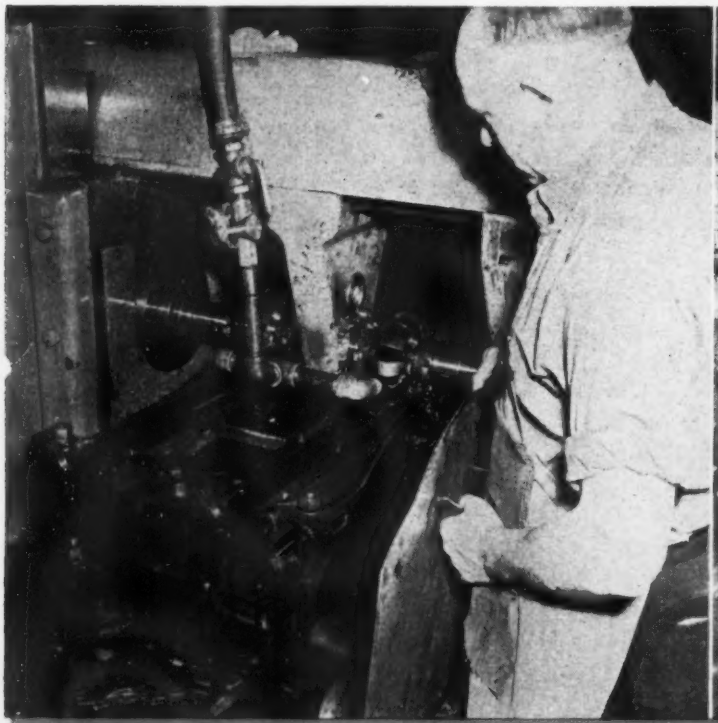
The bronze side frames present the most difficult machining problems of any part in the loader mechanism. Required in rights and lefts, these frames have a tenon on the outer side which must be held in close relationship to a rail that guides reciprocating elements connected with the loader tray. Fourteen surfaces are machined on the inner side of the loader side frame, some of these surfaces being pads and others related to curved slots.

To reduce wear upon expensive cutters, the inner side of the side frame is rough turned on a boring mill with simple forged tools, thereby removing the hard uneven skin of the casting and leaving a fairly uniform stock allowance for the semi-finish and finish milling operations.

But before completing the operations on the inner portion of the side frame, it is necessary to finish machine the surfaces on the outer side. For example, the rail is milled absolutely straight and within 0.002 in. for thickness with a gang-cutter set-up. In the following operation a bridge-type miller face mills the tenon surface on the forward stroke of the table, and upon the return stroke a planer type tool-block fitted to the bridge cuts 3/32 in. radii upon the guide-rail edges. This machine was built from elements left over from car-production days.

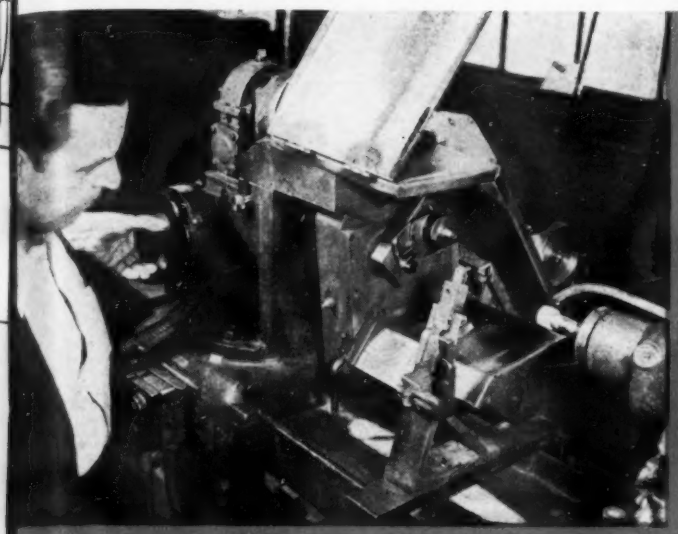


Blueprint tolerances were too loose for the locating points when grinding extractor cams in mass production to the required limts for parallelism at X, Y and Z. Improved grinding practices give assemblies that check 100 percent for contour and dimensions in a master gage

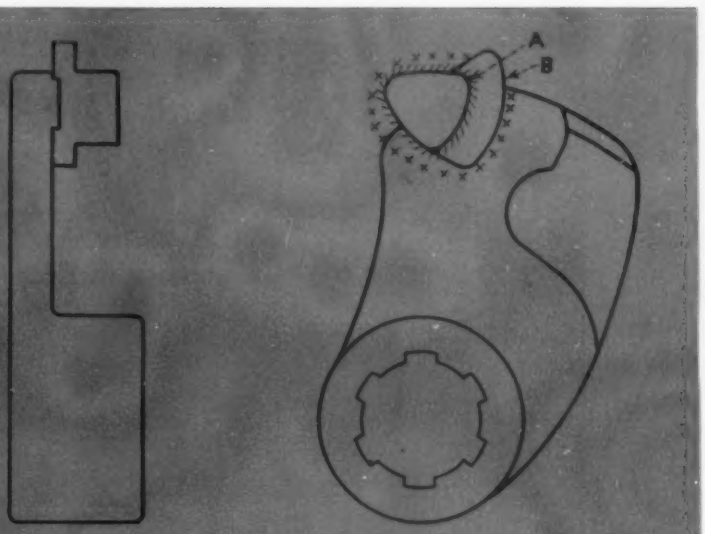


Set-up blocks (over which the cutting oil is flowing) are built into many milling machine fixtures, and located 1/8 in. low with respect to the machined work surface. Thus it is easy to set up the cutter to the block with a 1/8 in. feeler. Here the shell guide in the loader tray is being finished

To grind the points on extractor-lever cams, a three-station fixture has been set up on a cutter grinder. The two levers comprising a set are moved progressively from fixture to fixture for grinding the lower cam hook to size and parallel with respect to the journal diameter



By applying a special workhead to an internal grinder, in place of the original headstock, a double heart cam on the breech-block crank is ground to closer than required limits and faster than customarily found in such small work



One of the requirements in grinding the double heart cam on the breech-block crank is that cams *A* and *B* must match for about one-half the periphery of the smaller heart. A two-piece master cam three times the work size controls grinding to close limits

At this point an unusual equipment adaption is employed to semi-finish mill the fourteen surfaces on the inner portion of the side frame to rigid limits for size, parallelism and location. A vertical rotary mill formerly employed to machine the top and bottom of cylinder blocks underwent a radical face lifting. Multiple-spindle milling heads were mounted on the front and rear of the rail, and spaced to produce the required radii in the T-slots mentioned. Expressed another way, table rotation is employed to establish definite radii, not merely to provide a continuous feed.

Machine Work on the Loader-Tray

Each of the seven spindles carries either a facing cutter or an end and side cutting mill. Table fixtures receive right- and left-hand side frames alternately, to establish production on a continuous basis, with the only time lost being related to cutter changes.

Another of the Chrysler Corporation plants is responsible for the machining of a number of precision Bofors parts, in which milling is the predominant operation. Obviously the loading tray, which takes the projectile from the automatic loader and transfers it to the breech chamber, must be manufactured to fairly close limits and to a high finish to assure proper operation of the 40-mm. AA gun. To make this part approximately 75 "double" operations, (roughing and finishing) and 22 single operations are required.

To promote interchangeable manufacture and high production, these points in milling-fixture design have been followed for the loader-tray set-up:

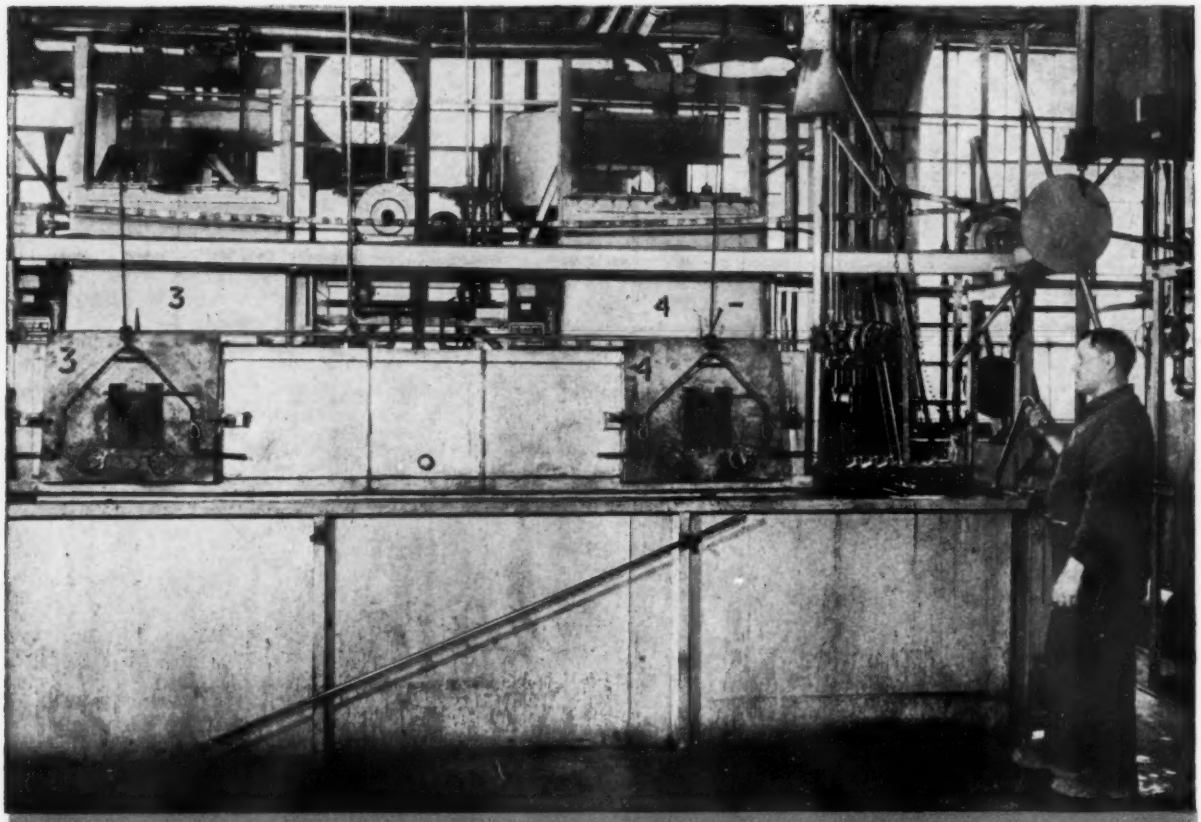
1. For a considerable portion of operations, the part is located from two holes: one for end location, the other for side location.

2. Set-up blocks are built into the fixtures. In all cases, these blocks are located $\frac{1}{8}$ in. low with respect to the surface machined in the operation, and the cutter is positioned with respect to the block by means of a $\frac{1}{8}$-in. feeler. In the case of a radius or form cut, a drill-rod feeler must be fully inserted between the periphery of the block and the cutter before the operation is started.

3. In step-milling operations, cuts are combined where possible and a turret stop in used in connection with a dial indicator.

4. On many "double" operations, the roughing and finishing fixtures are identical. Thus, if two machines are set up upon one of these double operations, breakdown of one machine will not halt production at this point, because both roughing and finishing cuts can be taken on the remaining machine through tool changes.

The plant producing the loader tray has developed certain kinks in small-parts grinding. The cam surfaces on the shell extractors roll with cams on the breech block, and it is essential that they not only roll properly but that the points on the two extractors engage and disengage with the breech block cams at the same instant. In other words, a high degree of parallelism is required with respect to the cam surfaces on the two extractors in a set, as well as parallelism



Duplex heat-treatment of many small 40-mm. AA gun parts permits quenching on a depressed critical temperature, thereby minimizing distortion. The two furnaces are connected by a sealed hood containing a lean atmosphere to protect the steel while the load is transferred from one furnace to the other

between these cam surfaces and the cylindrical bearing surface.

The cylindrical portion of the extractor is rough ground, and the cam surfaces are shaped on a gear shaper. After heat-treatment, the cylindrical bearing surface on the extractors is ground. To grind the hooks on the cams, the extractors are set up in a three-station fixture at a cutter grinder, taking location from the ground bearing surface.

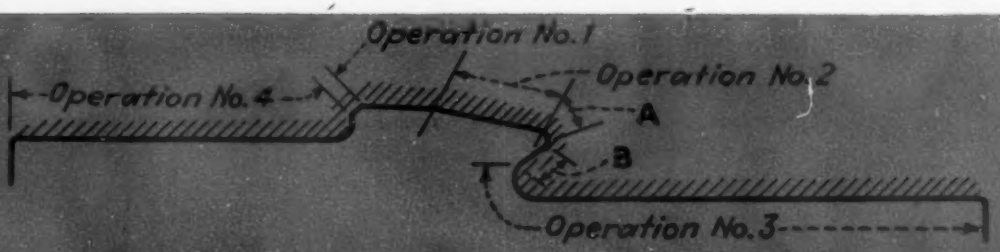
Grinders Converted for Crank Job

Another close grinding job is that in connection with the double heart cam on the breech-block crank. The limits on these cams for size and for position with respect to the splined hole are too close for consistent results upon a four-spindle profiler. Therefore, internal grinders left over from automotive production were rebuilt for the job.

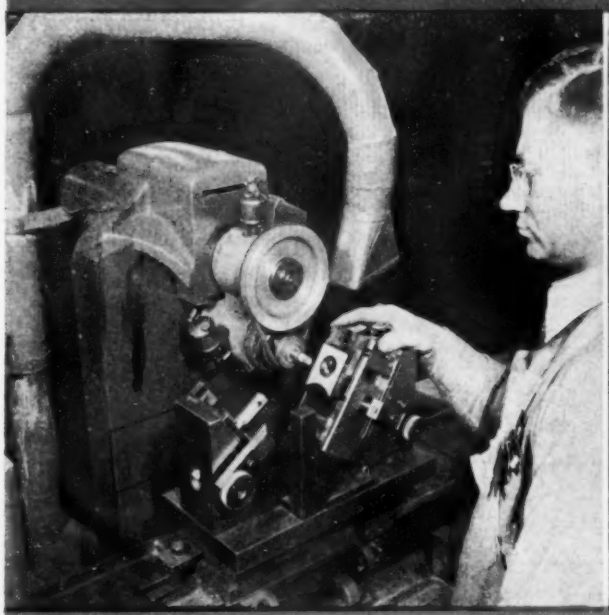
These machines were modified as follows: (1) the workhead was replaced with a special Chrysler-designed workhead, (2) a d.c. drive was provided to the workhead to give the operator close control of grinding at any point on the same outline, and (3) the hydraulic carriage feed was replaced with a rack and pinion feed.

The workhead is entirely gear-driven to avoid the use of universal joints. There are three shafts in this workhead, and they are placed in line vertically. The top shaft is in effect a hinge pin. The middle shaft has its centerline at the work center. The bottom shaft carries the master cam, which is three times the size of the work to minimize grinding errors. To maintain proper relationship of cam roller movement with work periphery, the spacing of the shafts is as follows: From work shaft to hinge shaft at 1:1 ratio, and from cam shaft to hinge shaft, a 3:1 ratio. However, the cam shaft is driven by the work shaft in a 1:1 ratio. The effect of this mechanism is to cause the workhead to swing in an arc on the hinge shaft, while the workpiece is caused to rotate about its center.

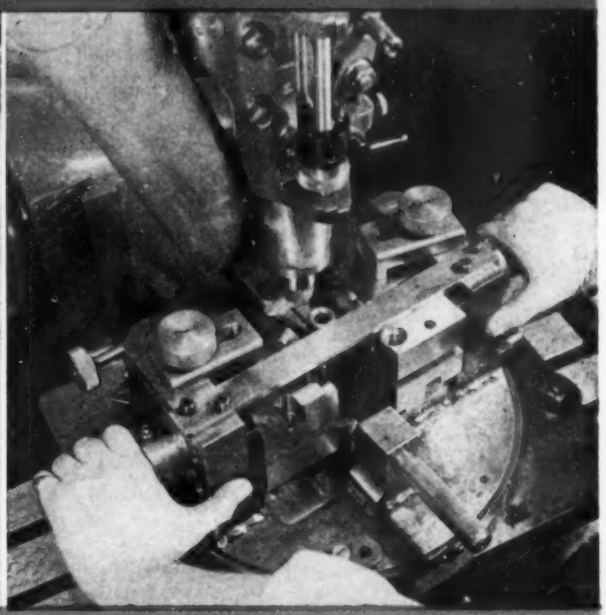
When one of the heart cams is ground, the master cam is shifted axially on its shaft for grinding the second cam. The master cam is of two-piece construction, with the components ground to such accuracy that the two heart cams on the work blend very closely for approximately one-half the periphery of the smaller



Radii on the extractor cams are ground by wheels dressed to size and by the use of fixtures that swivel about the proper center



By holding the sides, bottom and firing-pin hole to a close limit, it is possible to achieve the desired degree of parallelism when grinding extractor cams on opposite sides of the breech block. This is the first of several operations in grinding these cams



For grinding a radius, identified as *B* in an accompanying drawing, on the breech-block extractor cam, the wheel is dressed to size, set to the gage shown just behind it, and the fixture is then swung about its pivot to grind this radius on two pieces at once

heart. Another breech crank with a single heart cam is ground in a similar set-up.

To minimize distortion of a number of smaller gun parts, none longer than 24 in. nor higher than 4½ in., a Chrysler plant installed two batch-type furnaces connected by a sealed transfer hood. Controlled atmospheres are employed in both furnaces and the hood. A rack-operated buggy moves the charge between the furnaces, lifts it up to the charging levels for the furnaces, or drops it into the quench, from either furnace, as desired. Some parts are quenched from the high-heat furnace.

Most parts heat-treated in this equipment are either SAE 4340 or 4140. Cycle in the first furnace normally consists of heating the charge to 1475 F., and holding for one hour. When withdrawn to the hood, the charge is held in a lean atmosphere for approximately 5 min. so that the temperature drops under 1,200 F., and the steel has an opportunity to de-gas, or rid itself of excess CO. The charge is next put in the second furnace and held at 1,325 F. for approximately 30 min., before being quenched in oil.

The object of the furnace transfer (or duplex heat-treatment), is thus to quench on a depressed critical temperature, thereby minimizing distortion. In SAE 4340 and 4140 steels there is a tendency to produce retained austenite, which can be eliminated by the duplex heat-treatment because time is given the austenite to go into solution to form martensite. The atmospheres within the furnaces, being free of oxygen and carbon dioxide, produce parts free from scale and decarburization.

The as-quenched hardness ranges between 50-55 Rockwell C. Therefore the work is drawn at 700 F. for one hour to attain a hardness of 45-48 Rockwell C.

The breech ring, breech block and recoil-cylinder assembly, the principal gun parts made at still another Chrysler plant, are among the most difficult Bofors

components. The grinding of the extractor cams and the crank pockets in the breech block presented problems. It was necessary for this plant to establish manufacturing limits for the locating surfaces on the piece. The drawing allowed a limit for the two sides of several thousandths. However, the extractor-cam contours, a combination of several radii and angular surfaces, must be held to about one-quarter of the limit for parallelism (a cam is found on each side of the breech block and it rolls with the cam on the mating extractor lever previously discussed). The limits were impossible to maintain with automatic tracer control. Hence, the extractor cam is ground in approximately nine operations.

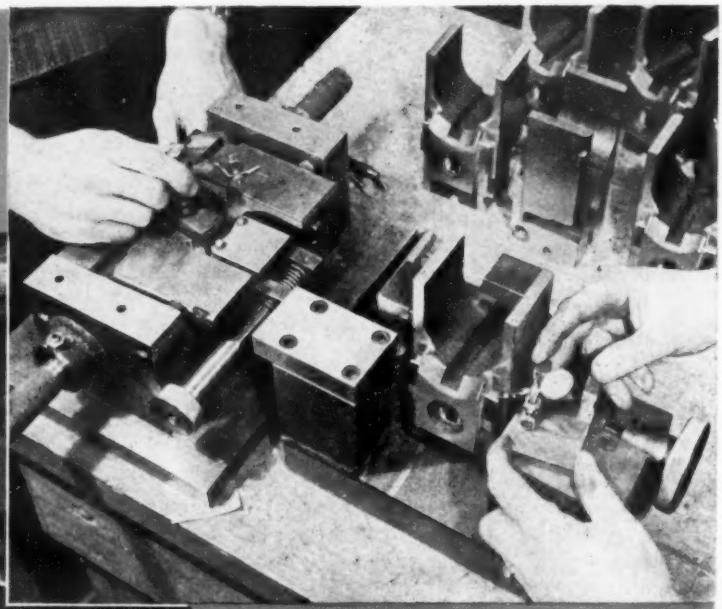
Breech Block Contours Ground

Grinding-fixture design has been worked out to achieve the desired degree of parallelism for cam contours on opposite sides of the breech block. As the first operation, the block is set up in one of the two inclined fixtures on a precision-type surface grinder. Part location is taken from the bottom, sides and firing-pin hole. A small flat, operation No. 1 (see sketch on previous page) is ground. Then the block is transferred to the opposite fixture for grinding the same flat on the cam contour at the other side of the block. It is possible to set up two pieces at once in the fixture and traverse the table to bring one piece after the other under the wheel. A dial indicator set to zero at the gage post (at front of fixture) will then read zero when the radius on the two pieces is checked. Of course, in production, the parts are not gaged at the machine, an inspection gage being provided nearby.

The angular face, operation 2, is ground in similar, inclined fixtures. Operations 3 and 4 are combined upon one machine, the wheel being dressed to the proper radius to finish the radii connecting the long flat surfaces with the extractor cam.

To grind radii *A* and *B*, the breech block is located in fixtures that are hand-rotated about the correct center. The wheels in both cases are close coupled and driven by a high-speed grinding head to avoid taper. For grinding the large radius, the wheel is dressed and set up to a gaging surface, or semi-circular piece, at the rear of the fixture. Two pieces are ground at once. It is possible to check the radii on the parts while in the fixture, but an inspection fixture is the faster method.

Cam points, identified as radius *A* in an accompanying sketch, must be ground exactly parallel for otherwise the extractor levers would operate out of step and cause misfiring



At left, checking radius *B* on the extractor cam. The indicator, set to zero on the curved gaging element in the fixture, must read the same when swung to left or right to contact the extractor radii on two breech blocks. Right, height of radius *A* on opposite sides of the breech block must read the same when checked with a dial indicator

TIME-DATA SHEET NO. 48

Radial Drill Press Operations—XIII

(Continued from Time-Data Sheet No. 47)

SYNTHESIS—SET-UP TIME:

Set-up constant per job:
$0.1430 = 1.04\ (A_2 + B_2 + C_2 + F_2 + G_2 + D_3 + D_3 + E_3 E_3 + J_2) = 1.04\ (0.0500 + 0.0141 + 0.0178 + 0.0084 + 0.0132 + 0.0058 + 0.0058 + 0.0051 + 0.0051 + 0.0126)$.

Constant when tools are secured from toolroom:
$A = 0.0900 = 1.04\ (D_2) = 1.04\ (0.0865)$.

Constant for sort out tools, per tool:
$B = 0.0118 = 1.04\ (E_2) = 1.04\ (0.0113)$.

Constant for jig handled by hand:
$C = 0.0223 = 1.04\ (N_2 + R_2 + S_2) = 1.04\ (0.0103 + 0.0075 + 0.0036)$.

Constant for jig handled by jib crane:
$C = 0.0755 = 1.04\ (N_2 + X_6 + B_3) = 1.04\ (0.0103 + 0.0352 + 0.0270)$.

Constant for jig handled by over-head crane:
$C = 0.1740 = 1.04\ (H_3 + W_7 + Y_6 + C_3 + N_2) = 1.04\ (0.0500 + 0.0451 + 0.0450 + 0.0165 + 0.0103)$.

Constant for angle plate:
$D = 0.1460 = 1.04\ (A_3 + C_3 + B_3) = 1.04\ (0.1140 + 0.0075 + 0.0190)$.

Constant for vise:
$E = 0.0655 = 1.04\ (T_2 + U_2 + V_2 + W_2) = 1.04\ (0.0103 + 0.0075 + 0.0336 + 0.0115)$.

Constant for first clamp and bolt — table work:
$F = 0.0270 = 1.04\ (X_2 + Y_2) = 1.04\ (0.0090 + 0.0170)$.

(Continued on Time-Data Sheet No. 49)

Table No. 13—Time For Pipe Taps

Time to Tap One Hole—(Decimal Hours)

STANDARD TAPERED PIPE TAPS

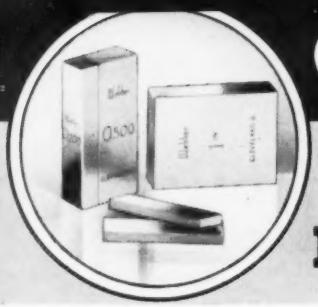
Cast Steel, Cold or Hot Rolled Steel and Malleable Iron

Tap Size	1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2
Thds. per In.	27	18	18	14	14	11 1/2	11 1/2	11 1/2	11 1/2	8	8	8
Approx. Depth Tapped	3/8	5/8	11/16	7/8	11/16	1	1 3/16	1 3/8	1 3/8	1 5/16	1 11/16	1 3/4
R.P.M.	170	127	102	82	65	52	35	30	24	20	16	14
Time Per Hole	0.0027	0.0038	0.0060	0.0061	0.0081	0.0089	0.0152	0.0206	0.0256	0.0241	0.0328	0.0386
Cast Iron, Brass and Copper												
R.P.M.	330	248	198	159	127	102	74	64	52	43	35	30
Time Per Hole	0.0016	0.0022	0.0028	0.0034	0.0043	0.0047	0.0075	0.0099	0.0121	0.0115	0.0151	0.0183

STANDARD STRAIGHT PIPE TAPS

Cast Steel, Cold or Hot Rolled Steel and Malleable Iron

Tap Size	1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2
Thds. per In.	27	18	18	14	14	11 1/2	11 1/2	11 1/2	11 1/2	8	8	8
R.P.M.	170	127	102	82	65	52	35	30	24	20	16	14
Depth Tapped	Allowed time in decimal hours (includes lead of tap)											
1/8	0.0017	0.0021	0.0025	0.0026	0.0032	0.0036	0.0051	0.0059	0.0073	0.0080	0.0100	0.0113
1/4	0.0025	0.0028	0.0034	0.0034	0.0042	0.0047	0.0067	0.0077	0.0096	0.0100	0.0123	0.0140
3/8	0.0033	0.0034	0.0042	0.0043	0.0053	0.0057	0.0082	0.0095	0.0118	0.0119	0.0147	0.0167
1/2	0.0040	0.0041	0.0050	0.0051	0.0063	0.0068	0.0098	0.0114	0.0141	0.0138	0.0171	0.0194
5/8	0.0048	0.0048	0.0059	0.0059	0.0073	0.0078	0.0113	0.0132	0.0164	0.0157	0.0195	0.0222
3/4	0.0056	0.0054	0.0067	0.0067	0.0084	0.0089	0.0129	0.0150	0.0187	0.0175	0.0218	0.0248
7/8	0.0063	0.0061	0.0076	0.0075	0.0094	0.0099	0.0144	0.0168	0.0209	0.0195	0.0243	0.0276
1	0.0071	0.0068	0.0084	0.0083	0.0100	0.0110	0.0156	0.0186	0.0233	0.0215	0.0268	0.0304
1 1/4	.....	0.0078	0.0101	0.0100	0.0124	0.0131	0.0191	0.0223	0.0279	0.0254	0.0316	0.0359
1 1/2	.....	.....	.....	0.0116	0.0145	0.0152	0.0220	0.0260	0.0324	0.0291	0.0354	0.0414
1 3/4	.....	.....	.....	.....	0.0166	0.0174	0.0254	0.0296	0.0370	0.0329	0.0409	0.0464
2	.....	.....	.....	.....	.....	.....	0.0281	0.0232	0.0416	0.0368	0.0459	0.0600
Cast Iron, Brass and Copper												
R.P.M.	330	248	198	159	127	102	74	64	52	43	35	30
Depth Tapped	Allowed time in decimal hours (includes lead of tap)											
1/8	0.0011	0.0013	0.0014	0.0016	0.0019	0.0020	0.0026	0.0030	0.0036	0.0040	0.0048	0.0055
1/4	0.0015	0.0016	0.0019	0.0020	0.0024	0.0026	0.0034	0.0039	0.0047	0.0048	0.0058	0.0068
3/8	0.0019	0.0020	0.0024	0.0024	0.0029	0.0031	0.0041	0.0047	0.0057	0.0057	0.0065	0.0081
1/2	0.0023	0.0023	0.0028	0.0028	0.0034	0.0036	0.0048	0.0056	0.0068	0.0066	0.0080	0.0093
5/8	0.0027	0.0027	0.0032	0.0032	0.0039	0.0042	0.0056	0.0064	0.0079	0.0075	0.0091	0.0106
3/4	0.0031	0.0030	0.0037	0.0037	0.0045	0.0047	0.0063	0.0073	0.0089	0.0084	0.0102	0.0118
7/8	0.0034	0.0033	0.0041	0.0041	0.0050	0.0052	0.0070	0.0081	0.0099	0.0093	0.0124	0.0132
1	0.0038	0.0037	0.0045	0.0045	0.0055	0.0058	0.0078	0.0090	0.0110	0.0102	0.0139	0.0145
1 1/4	.....	0.0044	0.0054	0.0054	0.0066	0.0069	0.0093	0.0107	0.0131	0.0119	0.0163	0.0170
1 1/2	.....	.....	.....	0.0062	0.0076	0.0077	0.0107	0.0124	0.0152	0.0137	0.0187	0.0197
1 3/4	.....	.....	.....	.....	0.0087	0.0090	0.0122	0.0142	0.0174	0.0154	0.0210	0.0220
2	.....	.....	.....	.....	.....	0.0101	0.0137	0.0159	0.0195	0.0173	0.0236	0.0246

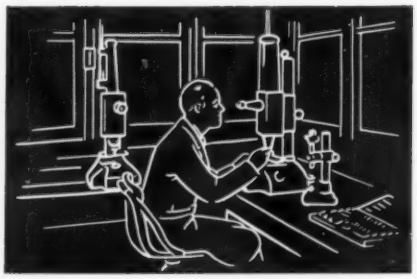


GAGE BLOCK FACTS

"How to"—USE—SELECT—CARE FOR PRECISION GAGE BLOCKS

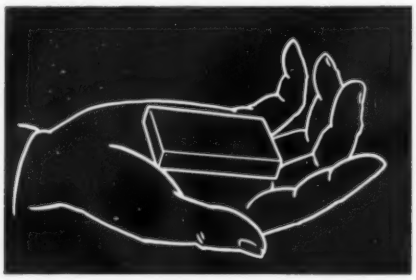
No. 1—Effect of Temperature Changes

The effect of temperature is negligible in the use of ordinary measuring instruments. Not so with gage blocks—improper handling causes temperature changes which expand or contract metal in blocks thus making errors of measurement.

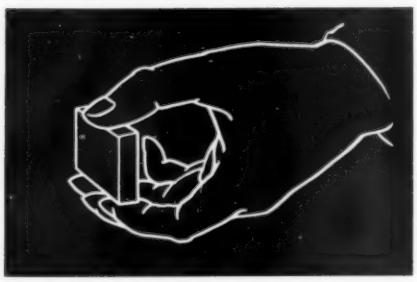


For the most accurate results measuring should be done in air conditioned, temperature-controlled gaging rooms—common to many plants today.

In the control of measuring temperature, it is important to avoid conducting body heat to the gage block through careless handling. Never hold a gage block in the hand, as shown below, when making a measurement. This will raise the temperature of the block and introduce a serious error in the measurement, particularly in a stack of blocks.



The best practice is to handle them only when blocks must be moved. Then only with the tips of the fingers, as illustrated, and for the briefest period possible.



Holding a 1" block in the palm of the hand for a few minutes might raise the temperature as much as 10 degrees causing length to change as much as 50 or 60 millionths of an inch, or approximately .00005. With stack of blocks four inches long, it would be four times as much.

In checking working blocks against a master set, the possible error due to handling etc. can be eliminated by leaving the blocks to be compared side by side on a surface plate for at least 15 minutes.

Error due to excessive handling of blocks is important in close tolerance work. Users should therefore be thoroughly familiar with the correct method of handling.

Webber Gage Blocks made to tolerances of .000004 inch should be treated with extreme care, as outlined above, if reliable results are to be obtained.

Because of critical wartime demands Webber's entire productive capacity is being devoted to the manufacture of GRADE A GAGE BLOCKS only.

Prompt delivery assured all firms furnishing the necessary priority certificates. Price for Set No. 84A—$350.00. Set No. 40A—$185.00.

Write for extra copies of this advertisement. Available free.

Webber GAGE COMPANY

12901 TRISKETT RD., CLEVELAND, OHIO

TIME-DATA SHEET NO. 49

Radial Drill Press Operations—XIV

(Continued from Time-Data Sheet No. 48)

Constant for each additional clamp and bolt — table work:
$G = 0.0180 = 1.04\ (Z_2) = 1.04\ (0.173)$.

Constant for set, place and adjust parallel (per parallel):
$H = 0.0065 = 1.04\ (J_3) = 1.04\ (0.0062)$.

Constant for removing table and replacing on machine with crane:
$J = 0.1580 = 1.04\ (H_2 + K_2 + M_2) = 1.04\ (0.0500 + 0.0512 + 0.0512)$.

Constant for adjust table at angle and return:
$V_1 = 0.0455 = 1.04\ (L_2) = 1.04\ (0.0438)$.

Constant for clean slots in bedplate, when parts are clamped to bedplate:
$W_1 = 0.0520 = 1.04\ (H_2) = 1.04\ (0.0500)$.

SYNTHESIS—EACH PIECE TIME:

Constant for small part in jig:
$0.0058 = 1.04\ (F_4 + P_4 + W_5) = 1.04\ (0.0020 + 0.0021 + 0.0015)$.

Constant for medium part in jig:
$0.0097 = 1.04\ (G_4 + Q_4 + X_5) = 1.04\ (0.0028 + 0.0036 + 0.0029)$.

Constant for large part in jig:
$0.0144 = 1.04\ (H_4 + R_4 + Y_4) = 1.04\ (0.0035 + 0.0060 + 0.0044)$.

Constant for very large part in jig — by hand:
$0.0204 = 1.04\ (J_4 + S_4 + Z_5) = 1.04\ (0.0049 + 0.0083 + 0.0064)$.

Constant for very large part in jig — jib crane:
$0.0790 = 1.04\ (J_4 + T_4 + A_6 + Q_3 + T_3) = 1.04\ (0.0049 + 0.0352 + 0.0270 + 0.0062 + 0.0028)$.

Constant for very large part in jig — over-head crane:
$0.1250 = 1.04\ (J_4 + U_4 + Q_3 + T_3 + W_7 + B_6) = 1.04\ (0.0049 + 0.0450 + 0.0062 + 0.0028 + 0.0451 + 0.0165)$.

Put chuck in spindle and remove:
$K = 0.0105 = 1.04\ (K_3 + L_2) = 1.04\ (0.0047 + 0.0054)$.

Put keyed chuck in spindle and remove:
$L = 0.0229 = 1.04\ (D_4 + E_4) = 1.04\ (0.0127 + 0.0093)$.

Put tool in chuck and remove, start and stop spindle:
$M = 0.0047 = 1.04\ (M_3 + N_3) = 1.04\ (0.0025 + 0.0020)$.

Move arm to hole or from hole to hole, raise and lower spindle — small and medium parts:
$N = 0.0031 = 1.04\ (S_3) = 1.04\ (0.0030)$.

Move arm to hole or from hole to hole, raise and lower spindle — large parts:
$N = 0.0042 = 1.04\ (D_8) = 1.04\ (0.0040)$.

Lubricate tap with brush:
$P = 0.0019 = 1.04\ (X_3) = 1.04\ (0.0018)$.

Burr tapped holes, per hole (includes move to hole or from hole to hole):
$Q = 0.0025 = 1.04\ (W_3) = 1.04\ (0.0024)$.

Clean "blind" hole before and after tapping:
$R = 0.0016 = 1.04\ (Z_3 + A_4) = 1.04\ (0.0008 + 0.0007)$.

Set dial for depth:
$S = 0.0050 = 1.04\ (Y_3) = 1.04\ (0.0048)$.

Raise and lower arm on column:
$T = 0.0100 = 1.04\ (U_3 + V_3) = 1.04\ (0.0054 + 0.0042)$.

Turn small jig over by hand:
$U = 0.0011 = 1.04\ (K_4) = 1.04\ (0.0011)$.

Turn medium jig over by hand:
$U = 0.0020 = 1.04\ (L_4) = 1.04\ (0.0019)$.

Turn large jig over by hand:
$U = 0.0027 = 1.04\ (M_4) = 1.04\ (0.0026)$.

Turn very large jig over by hand:
$U = 0.0042 = 1.04\ (D_8) = 1.04\ (0.0040)$.

Turn very large jig over with jib crane:
$U = 0.0530 = 1.04\ (Q_3 + E_6 + T_3) = 1.04\ (0.0062 + 0.0420 + 0.0028)$.

Place and remove jig bushing, per hole:
$V = 0.0022 = 1.04\ (C_5) = 1.04\ (0.0021)$.

(To be continued)

Table No. 14—Time To Ream Various Materials

Reamer dia.	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3
Cast Steel, Cold or Hot Rolled Steel and Malleable Iron (20 ft. per min.)													
R.P.M.	306	205	152	102	77	61	51	44	38	34	31	28	26
Feed per rev.	0.012	0.015	0.021	0.029	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035
Time per inch	0.0052	0.0062	0.0060	0.0066	0.0072	0.0091	0.0108	0.0126	0.0146	0.0163	0.0179	0.0198	0.0213
Bronze and Annealed Steel (24 ft. per min.)													
R.P.M.	367	244	180	120	92	74	62	53	46	41	37	33	31
Feed per rev.	0.012	0.015	0.021	0.029	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035
Time per inch	0.0044	0.0052	0.0051	0.0056	0.0060	0.0075	0.0089	0.0104	0.0120	0.0135	0.0150	0.0168	0.0179
Copper (28 ft. per min.)													
R.P.M.	428	284	210	140	107	86	72	61	53	48	43	39	36
Feed per rev.	0.012	0.015	0.021	0.029	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035
Time per inch	0.0037	0.0045	0.0044	0.0048	0.0052	0.0064	0.0077	0.0091	0.0105	0.0115	0.0129	0.0142	0.0154
Cast Iron (36 ft. per min.)													
R.P.M.	550	367	270	180	138	111	92	79	68	61	55	50	46
Feed per rev.	0.012	0.015	0.021	0.029	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035
Time per inch	0.0029	0.0035	0.0034	0.0037	0.0040	0.0050	0.0060	0.0070	0.0082	0.0091	0.0101	0.0111	0.0121
Brass and Aluminum Alloy (42 ft. per min.)													
R.P.M.	642	427	315	210	160	129	107	92	80	71	65	59	53
Feed per rev.	0.012	0.015	0.021	0.029	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035
Time per inch	0.0025	0.0030	0.0029	0.0032	0.0035	0.0043	0.0052	0.0060	0.0069	0.0078	0.0085	0.0094	0.0104

AMPCO TWIST DRILL CO.
JACKSON, MICHIGAN U. S. A.
CHICAGO . DETROIT . CLEVELAND . PHILADELPHIA
Distributors in All Principal Cities

Have You Stopped To Think—

WHERE WOULD WE be today if we had not been able to maintain a strong machine tool industry through bad and good times? We'd be in the worst fix in our history.

You can't make weapons in the quantities needed in modern warfare without machine tools. Thus the present and future safety of our nation is tied to our machine tool industry, which fortunately is the best in the world.

Despite these facts, a process is at work which will help destroy this industry unless a halt is called. The process is the renegotiation of contracts.

We sympathize with the motive behind renegotiation. It seeks to prevent profiteering, which every loyal American detests. But let's not be carried away simply by emotions. Suppose we look at the facts.

War contractors divide into two classes. One consists of manufacturers of consumer goods, such as refrigerators, who now are making guns. Their war products bear no relationship to their peacetime products.

They came into their present work without experience in it. They are more proficient now than when they started. Their costs are lower. And they had little basis on which to set prices; some of these prices may have been too high. In such cases, a portion of the profits should be returned to Uncle Sam. Many contractors already have done that voluntarily.

When the war ends they will go back to making refrigerators and radios and automobiles, knowing that a large, pent-up demand awaits them as a result of the wartime ban on their normal products.

But what of the second class of war contractors, typified by machine tool builders? They aren't so fortunate, because for war purposes they have been making the same product as in peacetime, and have stepped up their output to eight times its prewar size. They have turned out for war production as many machine tools the last four years as were made in the previous forty years.

A vast number of these machines will be adaptable to peacetime use as soon as the war ceases. As one builder said, "By equipping the country for war, the machine tool industry has practically put itself out of business for at least a decade."

To recite a little history, from a high point of $222,000,000 in the first World War, machine tool production declined to a mere $23,000,000 in 1921. The industry staggered through the crisis and came back in the late twenties, only to drop down to $22,000,000 in 1932. Foreign orders saved the day in the latter half of the thirties.

The only thing that brought the industry through lean times was the profit hump that it was able to live on. Every feast-and-famine industry must be permitted such a hump or it cannot survive.

Now renegotiators come along and propose to take away the hump acquired the last year or two or shrivel it alarmingly.

Anyone with a working knowledge of the machine tool industry knows that something more than "moderate reserves for contingencies" will be required to pull it through the years immediately following the war. It then will face the most critical period in its long up-and-down history.

With that period staring it in the face, the industry can ill afford to give up a dollar of its earnings under renegotiation procedures.

Above everything else, let's make sure that renegotiation, worthy as its purpose may be, is not used to undermine or destroy industries vital to our economic life and to our national safety.

Burnham Finney

GAGING BUSINESS

Transfer of war production emphasis created an erroneous impression that the peak need has been reached. Some raw materials are easier. Civilian production is supported as important to the war effort. Tool output but little lowered

Pressure Is But Shifted Peak war production will not be reached until September or October, despite the fact that output has slackened in some war goods. It is true that the program has been cut back in certain items particularly in ordnance, but this slowing down will be more than offset by the substantial acceleration in manufacture of airplanes and in the building of ships.

For war the federal government spent over six billion dollars last month. By fall expenditures should rise to more than nine billions a month. War officials are worried because curtailment in operations of some plants, such as tank factories, may give the impression that the heat is off production. That isn't the case. So far as the overall program is concerned, the pressure to get out more stuff is being put on more than ever before.

Conversion Was Quick Ordnance output has been sliced to bring it into line with the reduced materials available. This action has resulted in a large number of ordnance plants being transferred to manufacture of other products needed more badly. All but a few of these factories already are running at capacity, having been changed over at record speed. The fact is that ordnance production is rising and will continue upward to a high mark late this year. It then is expected to stay at that level.

Shipping is the bottleneck in war production calculations. There is bound to be a piling up of goods in the months ahead. If the United Nations should gain mastery over the submarine and reduce ship sinkings considerably, production schedules of some war items would be stepped up sharply. The amount of equipment lost by ship sinking by submarines is not of alarming proportions. Most important factor resulting from the squeeze in shipping tonnage is the limitation on what can be done in production.

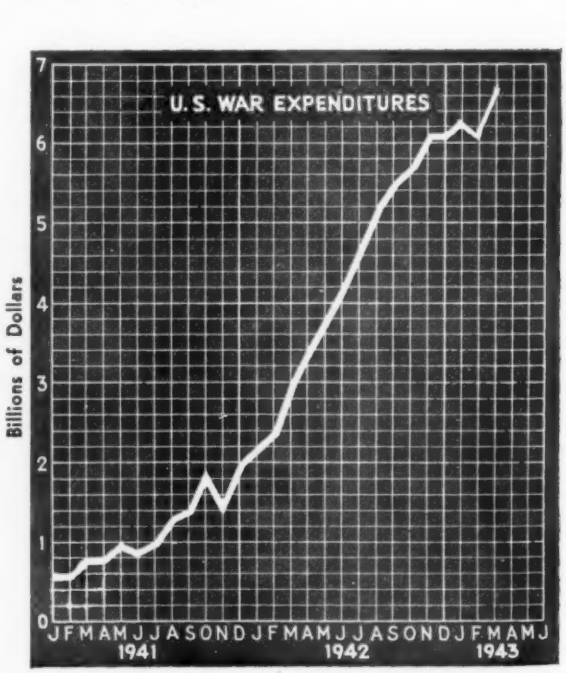
Raw Materials Are Easier Raw materials are not so tight as they were. The situation in one of the most critical materials has eased to the point where parts formerly made of this material and switched over to another material because of the shortage are now being switched back. That is because the building of new capacity is ahead of schedule and because requirements are somewhat less than expected.

Steel is surprisingly short. For the third quarter claimant war agencies have asked for much more tonnage of carbon steel than the industry can possibly make, even though steel operations are highest in history. It is becoming increasingly clear that finishing steel capacity will be available in certain steel lines later this year as war work tapers. Structural steel used for construction purposes is one example. War construction already has passed its peak. For many months ahead, however, all the steel ingot capacity will be required to supply the war program, aside from the small tonnage assigned to essential civilian needs. War officials deny emphatically the predictions heard here and there that steel operations will be down considerably below full capacity by the fourth quarter.

Civilian Needs Are Analyzed The War Production Board is re-examining durable consumer goods requirements of civilians. WPB officials freely admit that things have reached the stage where the government must take a look. Government people say that civilian supplies of essential goods can be so reduced as to impair proper functioning of the war effort itself. That is why civilian needs are being carefully analyzed item by item. Whatever easing is permitted can be taken care of by factory capacity still in existence with little or no reconversion necessary.

See Tool Output But Little Less Machine tool production in April is roughly estimated at $112,000,000. That means that output during the first four months of 1943 was around $460,000,000, or more than was produced in the entire year 1940. These operations, which since the first of the year have resulted in an outpouring of three times as many machine tools as are built in a normal peacetime year, will not continue at this rate. New orders, which after cancellations fall far short of matching production, indicate a slackening later on as backlogs dwindle. Leading members of the industry cling to earlier predictions that machine tool output this year will come within 10 percent of the all-time record established in 1942.

A surprising number of machine tool builders are making other war products or are in the process of getting ready to make them. In this way they can employ the slack capacity in their plants which have been greatly expanded since the war began and can put their unusual skills to maximum use. Among the products now being turned out by machine tool companies are turbines, airplane parts, diesel engine parts and parts for ordnance equipment.



Up It Goes Again—After four months of little or no rise, war expenditures for March swung upward to a new high: $6,743,800,218. This is an increase of 10.8 percent over the $6,081,000,000 expenditures of February

"Hold-the-Line" Order Will But Delay Wage Increases

Farm, labor blocs strive to unbalance the President's tight rope act. Each watches advantages given other, demands compensatory decisions. Incentive schemes pushed

By ROBERT COLBORN

WASHINGTON—Thousands of pending wage increases have been held up—for a few weeks at least—by the President's hold-the-line executive order on wages and prices. Ordering all the inflation-control agencies to stand firm against pressures for increases, the order is drastic in its language. It's not likely to have a very lasting effect, however, because it does little to remove the basic forces pressing towards inflation. At this stage of the long rear-guard fight against inflation, Roosevelt and Byrnes face strong attack from two directions: (1) from labor—spearheaded by John L. Lewis' threat to close the coal mines if his men don't get more money and (2) the farm bloc's legislative drive for higher farm prices.

Actually, the only element of strength in the anti-inflation camp is that the attack is coming from so many directions. Momentarily they balance.

The President's executive order is an attempt to freeze this delicate balance so as to make it possible to hold the line on inflation. At the same time, the intention is to reduce both pressures for increases by concessions—by increasing the dollar take-home without disturbing the formal wage-price structure. The wage earners' take-home can be increased by some such subsidy scheme as the incentive pay plan which WPB is now promoting; here again, the order deliberately left the way open for incentive pay.

But this subsidy scheme, too, has its troubles. WPB is running into technical difficulties trying to work out a base from which to measure increased output—something which wouldn't be so complicated as to be unintelligible. Moreover, although the application of the plan to extractive industries and to bottleneck plants seems to offer no insuperable difficulty, it's hard to see how it could be applied to the great bulk of war plants where the input of materials and parts, rather than the enthusiasm of the workers, determine output.

Top labor leaders have given temperate endorsement to the scheme, but it's likely to encounter labor suspicion down the line. Except in the communist-led unions, which are hot for anything which will increase production, labor has been consistently opposed to all incentive schemes.

The wage situation is not yet critical. Even though with their tongues in their cheeks, A.F.L. and C.I.O. leaders agree that they will stick with the Little Steel formula as long as prices don't go up. But any major break in the price line will precipitate a new wage offensive—and John L. Lewis will have to be dealt with before many weeks.

The executive order directed the War Labor Board and the Treasury to approve no wage increases beyond those permitted by the Little Steel formula. Upping of "sub-standard" wages is still permitted, but the Board's former authority to rectify "inequalities" is revoked.

Advisory Committee Named For Gear Manufacturers

WASHINGTON—Training of skilled machinists and operators for gear-cutting machines has become such a serious problem that a Gear and Speed Reducer Industry Advisory Committee has been formed in WPB and has held its first meeting in Washington in discussion of possible solutions.

It was agreed that each manufacturer should make his own plans for replacement of workers inducted into the armed services by training older men and women; also that no requests should be made by the manufacturers for deferment of workers who can possibly be replaced.

It was the opinion of the committee that General Scheduling Order M-293 will be helpful in calling attention to "tight spots" in critical common components. M-293 calls for the scheduling of some 35 such components—parts that are used in various end products, such as gears, antifriction bearings, speed reducers, pumps, valves, etc.

Members of the committee are: Rus. C. Ball, president, Philadelphia Gear Works; T. J. Bannan, executive vice-president, Western Gear Works; H. Browning, The Ohio Gear Co.; L. R. Botsai, manager, gearing dept., Westinghouse Elec. & Mfg. Co.; Rodney Davis, Rodney Davis & Co.; D. W. Diefendorf, president, Diefendorf Gear Corp.; Howard Dingle, president, Cleveland Worm & Gear Co.; J. E. McBride, vice president, Palmer-Bee Co.; R. B. Moir, manager, sales and engineering, Foote Bros. Gear & Mach. Corp.; C. J. Morrin, Boston Gear Works; T. F. Scannell, The Falk Corp.; and R. B. Tripp, Ohio Forge & Machine Corp.

R. C. Sollenberger, deputy chief, Material Handling Equipment Branch, WPB, presides.

Press Assn.

Have You Heard the Bazooka?—With a repertoire that literally has laid the Afrika Korps "in the aisles," the bazooka, the nation's most discussed military weapon, was an important factor in some of our North African victories. It gives the foot soldier superior combat effectiveness against armed vehicles, pill-box emplacements and even medium-sized tanks

Gear Stretcher — That the traversing gear racks, upon which the carriages of 90 mm. anti-aircraft guns revolve may be perfectly round, a spider-like device developed by Fisher Body Div., General Motors, is used to "stretch" it into a true circle. During this process the steel can be "stretched" as much as 0.006 in.

Steel Inspection Investigation Has Cut Production of Plate

WASHINGTON—On the spot as a result of the Truman Committee's report on falsification of steel plate inspection are (1) the Committee itself; (2) Donald Nelson; and (3) the plate producers.

The Committee, upon being told that production of plate has fallen off seriously due to inspection jitters, now finds it necessary to ask producers for reports in case their April rates of output fall below their March rates.

Mr. Nelson, to keep plate production even with shipbuilding demands, sent a wire to steel men telling them not to be too rigid in their inspection of plate. The Committee disagreed with his stand and Nelson then was moved to say that allowances should be made by inspectors only where specifications are not subject to exact ascertainment. Thus Nelson's second message tended to nullify his first.

Committee Has Upper Hand

The steel companies now must choose between Nelson and the Truman Committee as their boss, and they will be inclined to mind the Committee so long as its whip is out.

The steel incident started some months ago when a Liberty ship, the *Schenectady*, being built by Henry J. Kaiser at Portland, Oregon, broke up at dock. Kaiser said it was the steel, not his welders' work, which gave way. The American Bureau of Shipping agreed, saying the failure was in part due to Carnegie-Illinois plate. J. L. Perry, president of Carnegie-Illinois, disagreed with him.

The Truman Committee then started its investigation and during hearings adduced the admission from subordinates in the company's employ that they had falsified some of their inspections.

This subordinate said that sometimes the heat number of the steel became lost so that the analysis was unknown, and a suitable number was made up.

But the company's witnesses said that the steel furnished was entirely suitable for the intended purposes, despite testing irregularities, which officials said they had been unaware of until the investigation.

Benjamin F. Fairless, president of United States Steel, of which Carnegie-Illinois is a subsidiary, reiterated last week the company's earlier statements that the small variations from specified minimums could make no important difference in safety when the safety factor was three or four to one. Admiral Howard L. Vickery, vice-chairman of the Maritime Commission, stated at a meeting of Carnegie Steel with WPB, April 8, that the commission would have accepted the substandard plate even if the true test records on it had been available.

Each View Supported

Majority opinion in Washington seems to be that the Committee is correct in its position that inspectors should not be encouraged to depart from specifications. But in view of wide safety margins provided by all procurement specifications Nelson is right in his wish that producers be reasonable despite the Committee and turn out the steel.

Most likely there will be some relaxation in the ranges of tolerance in specifications for both Navy and Maritime Commission. There has been no instance of steel failure at sea, much less the loss of a ship.

Consensus is that the Committee has done more harm than good so far in its steel crusade.

WPB Uses Many Methods To Expedite Components

WASHINGTON—A substantial measure of credit for the encouraging March and April progress in aircraft, ships, escort vessels, and rubber plants goes to the success which WPB has achieved in widening out production bottlenecks in the so-called "critical common components." These are the basic standard parts and fittings that go into all sorts of things from airplanes to rubber plants. In many cases expansion of their supply had been overlooked in the rush to expand facilities for the new wartime goods—guns and planes and ships.

This was the first major problem that Charles Wilson tackled when he was made production vice-chairman of WPB. Wilson believed he could break the back of the problem in three months. They believe now they have it licked—at least to the extent of proving it can be licked.

Critical List Reduced

Of the 34 original critical common components, about one-third are now in good enough shape so that they can be dropped from the critical list in a month or two.

Total production of the 34 components this month will be about 75 percent greater than in December, WPB officials estimate.

Each component had its own special problems. But there were certain common factors. No new factories were built.

Valves are a good example. Estimated demand for 1943 was about three times the visible capacity. And there are thousands of types and sizes. Besides being the toughest, valves have shown the most spectacular results. Output this month will be twice that of December.

Nearly all the speed-up procedures used have been applied to valves, though detailed scheduling has been rather less important than in other cases. Standardization was perhaps the biggest single step. WPB put the pressure on the procurement agencies to stick to standard sizes—with considerable success.

Aid on Materials

An immediate step, of course, was to see that the valve manufacturers were assured, under PRP and CMP, all the material they could use. Similarly, they were given quick deliveries on a few critical machine tools. All the producers were pressed to subcontract as much of the simple part of their work as possible, and several new producers of complete valves were brought in. In particular, the Navy arsenals were encouraged, when they really need special-design valves, to make them themselves.

It was found that certain manufacturers with whom Navy and Maritime were used to doing business were overloaded while other firms had idle capacity. WPB agents went around the plants and did this job.

INSIDE DETROIT

BY SILER FREEMAN

Reuther starts move to combat wage and job freeze, demanding that auto industry negotiate as a unit. Detroit plant expansion ends; Murray plans Scranton unit. Ford now largest builder of heavy motors. Engineers form "labor" pool

Union to Fight "Freezes" President Roosevelt's wage stabilization order and the job freezing of 27,000,000 workers in the country will be fought by the UAW-CIO through demands for industry-wide wage negotiations, it was intimated here. The industry wide negotiations would bring the Big Three—GM, Ford and Chrysler—around the bargaining table together.

Behind this move to circumvent the wage and job freeze is the big idea man of the UAW, Walter P. Reuther. Reuther is usually about two steps ahead of everyone in figuring things out. He was the author of the famed Reuther plan, which stirred the entire country and finally smoked C. E. Wilson, president of General Motors, into a public debate with the labor chieftain. He is the foe of incentive pay.

Reuther broached the matter of industry negotiations to R. J. Thomas, president of the UAW, in a recent letter. A meeting of the international union executive board in Cleveland followed, obstensibly to formulate policies to combat the wage freeze. But Reuther's proposal was a big item.

Reuther's idea is to get "equal pay for equal work," as he puts it. He opposes the War Labor Board's policy of handling cases individually.

"Equal Pay for Equal Work" "The establishment of an over-all industry-wide wage agreement, based on equal pay for equal work, is the only basis for the establishment of a sound wage policy which will provide for the elimination of wage differentials and inequalities," says Reuther.

Reuther would divide the industry into major subdivisions to establish the same rates for the same work in every plant. On the face of it, this seems equitable. But Reuther's plans are usually far deeper than they appear on the surface. Industry will examine this one closely and then stand on what Washington outlined.

Meanwhile, GM is expecting some word from the UAW on reopening the wage section of their contract. The contract says "it may be" reopened and it seems that it will, despite the White House "hold the line" dictum.

Detroit Is "Skin Tight" It looks like plant expansion in Detroit is at an end. This was heralded by the Murray Corporation's announcement that it will build a new plant in Scranton, Pa. The new plant will employ about three-fourths as many persons as the Detroit plant.

The expansion was brought about through enlargement of the contracts for wing assemblies both on the Republic Thunderbolt and the Boeing Flying Fortress. Washington approved application for more equipment to undertake the orders, provided that it be installed outside the Detroit area.

The growing labor crisis in this area has agitated Washington much more than it has Detroit. Plant executives here, while working hard through the manpower utilization committee to bring tangible results to solve the problem, seem in no dither such as Washington shows by attaching the foregoing proviso to its okay.

Like the hubbub over materials and machinery, the industry has felt that if left alone, it could work out its own solution. The answer may be in the changing war strategy too. Heavy ordnance items are being gradually reduced and air equipment stressed.

While this phase is as yet without official confirmation, many of the companies are scurrying about for plane contracts to take up the slack, seen as only a few months off. If a cutback of severe proportions comes, it will "solve" local manpower shortage, temporarily.

Ford Is Top Engine Maker Ford is now the largest builder of engines for heavy bombers. The addition of a $34,000,000 contract for the 2,000-hp. Pratt & Whitney engine doubles the original Ford contract and puts the company out in front of all plane engine builders.

Both the Rouge and Highland Park plants will benefit by the new contract. Facilities at both plants will be utilized. Machinery is now being shifted to use space there, and in plants in Missouri, Tennessee, Ohio and New York.

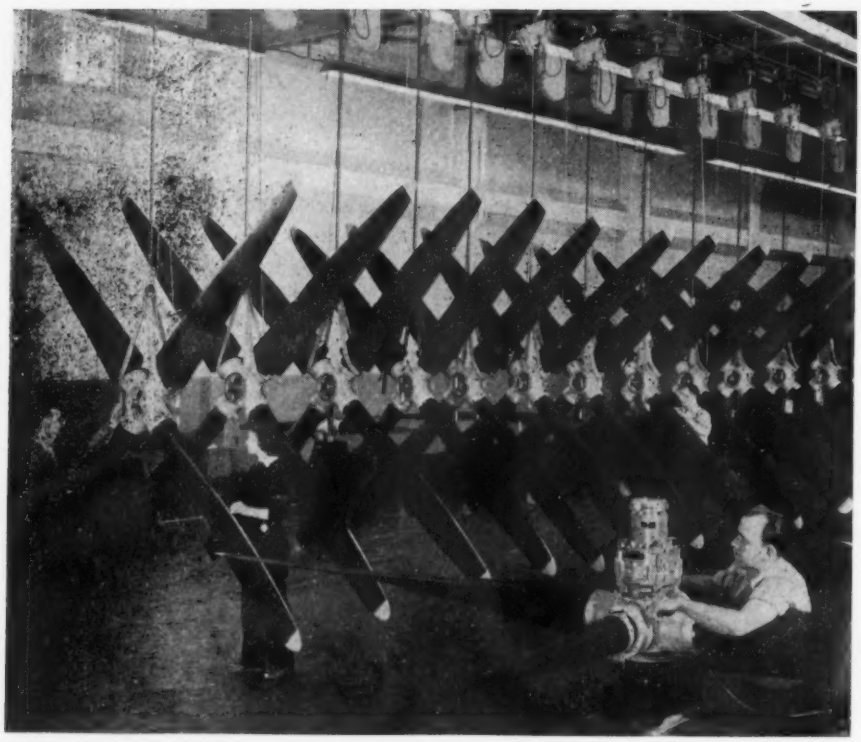
Large stocks of parts for the P. & W. engine are now being built up by existing facilities so that the movement of machinery will not interfere with meeting the upgraded schedules.

Form Pool of Engineers Not so long ago, Col. George E. Strong of the Central Procurement District of the Army Air Forces here, proposed a labor pool which would be shifted about where needed. The proposal was not taken very seriously because of many drawbacks.

But the Society of Mechanical Engineers here, has adopted the idea to aid employers of engineers throughout the nation. The society has catalogued the talents and abilities of more than 200 experts in all fields of mechanical sciences. There are 17 Detroit engineering firms in the pool, which is increasing daily, according to Robert L. Crinnian, president of the organization.

Willow Run Starts to Hum Turbulent Willow Run seems to have settled down, at least for the time being. Production is reported progressing steadily and the in-

From Bodies to Shells—With production schedules set at seven figures, Briggs Mfg. Co. uses automobile body presses to turn out 75 mm. steel cartridge cases. When the Ordnance Department shifted from brass to steel ammunition cases, Briggs was asked to develop a method to make them, and is today turning them out in great volume



Propeller Carriers Pep Production—Considered the largest and one of the most completely conveyorized propeller plants in the country, a new unit of Curtiss-Wright Corporation has just swung into full production "somewhere in Indiana." Shown are completed Curtiss electric propellers of the four-bladed type being carried along to the final balance room

WPB Sets up Clearing House For Used Electric Motors

WASHINGTON—The General Industrial Equipment Division of WPB now has set up a Used Motor Unit in its Electrical Equipment Branch, which is headed by John Gemmell. This unit has a file of about 30,000 used motors and generators, including those listed by motor dealers with OPA and those available in industrial plants.

Everybody who has a unit not in use, or which he can spare, is requested to report it to a WPB field office. Those in need are asked to apply to a field office, which will try first to spot available motors or generators as near the applicants as possible.

Purchase of new motors and generators is restricted by Order L-221; orders must carry ratings of AA-5 or higher, and must be accompanied by certification that applicant has made every reasonable effort: (1) to adapt unused equipment in his possession to purpose for which new equipment is sought; (2) to obtain used equipment; (3) to repair what he has.

In addition to serving as a clearing house, the Used Motor Unit reviews most applications for preferences on new equipment (on PD-1A) and tries to locate used units instead. The Used Motor Unit is under the direction of C. A. Sievert, a man of long experience.

roads of the draft and the services are being minimized by greater hiring of women. The female contingent there now is about 40 percent of the total, probably the highest in the area.

Meanwhile, the government housing is progressing rapidly. Work goes forward on the 2,500-unit town site, the 3,000 rooms for workers, 960 one-room apartments and the trailer camp for 500 private trailers. The rooms will be in Willow Lodge and the apartments will be one room affairs, fully furnished.

In Washington, Senator Homer Ferguson has been working on the transportation problem for the Run and announced recently that ODT had promised more buses to serve the bomber plant and the OPA more liberal rulings on tires and gas for the workers there.

To End Arrangement

DAYTON, OHIO—The Sheffield Corportation, here, and the Wickman Corporation, Detroit, have been operating jointly under an exclusive manufacturing and selling agreement involving certain machine tools. Under this agreement The Sheffield Corporation designs and manufactures these machine tools for the American market. This joint operation is being discontinued by mutual consent upon completion of orders accepted under this agreement.

WAR RULINGS IN BRIEF

Checklist of Significant Regulations on Materials and Prices

ALLOYS—To conserve critical alloys, steel mills have been ordered to make more extensive use of scrap turnings, in an amount not less than 8 per cent, including machine shop turnings in amount not less than 4 percent of total weight of alloy steel ingots and castings produced each month. (Order M-21-a.)

ALUMINUM—Regulation which became effective April 1 provides a method for acquisition of maintenance, repair and operating materials by aluminum and magnesium producers, and order P-120 covering these products has been revoked. (CMP Regulation 5.)

CALCIUM METAL—This vital metallurgical material has been placed under allocation. (Preference Order M-303.)

CARBON PLATES—Standard specifications for carbon steel plates, reducing the number which may be produced to approximately 25, have been established in Schedule 8. (Limitation Order L-211.)

COPPER SCRAP—Dealers who accept this material as a scrap may not dispose of it in any other form, except with specific permission. (Supplementary Order M-9-b.)

FERROUS FORGINGS—A new price regulation, to meet practices and problems of this industry as well as to simplify current controls, has been issued. (Maximum Price Regulation 351.)

DRUMS—Users of steel drums or parts have been directed to apply for authorization to purchase new ones on Form PD-835 instead of by letter. The order prohibits manufacturers from selling, delivering, or using new steel drums without specific authorization. (Order M-255.)

GRAY IRON CASTINGS—A definition has been issued that enables sellers of products containing gray iron castings, or of castings alone, to determine easily whether their products should be priced under MPR or some other price regulation. (Maximum Price Regulation 244, Amendment 4.)

IRON AND STEEL—Changes governing deliveries of these products have been made to eliminate confusion resulting from operation of the Controlled Materials Plan. (Preference Order M-21 Amended.)

LIGHTING FIXTURES—Amount of metal permitted in manufacture of standard utility and industrial incandescent fixtures has been cut by 60 percent. (Order L-212.)

PLASTIC FIXTURES—Such items for molding machinery are now under allocation. (Order L-159.)

SECOND - HAND MACHINERY—Methods for determining maximum prices for second-hand machine tools or extras in sales by Defense Plant Corp. has been announced. (Revised Price Schedule 1, Amend. 3.)

WARTIME WASHINGTON

BY BLAINE STUBBLEFIELD

Transportation, by land and by sea, takes the spotlight: the Office of Defense Transportation warns that rail breakdown threatens, and the Truman Committee reports its findings in the cargo and naval vessel building programs

Concerned Over Transportation The War Production Board now has to decide whether to cut into military programs in order to release steel for new railroad equipment. It has been warned by the Office of Defense Transportation that a transportation breakdown threatens. ODT is demanding, for a third quarter, construction of 30,000 freight cars, 203 diesel locomotives and some 2,200,000 tons of rail and track accessories.

The railroads have been getting along so far on an allocation made last fall of 20,000 cars and 386 locomotives. Last February, ODT asked for 1,759,000 tons of steel for track, cars, and locomotives for the second quarter. The requirements committee allowed 350,000 tons of rail, 245,000 tons of track accessories, and 367 locomotives—for a total of 1,240,000 tons. But no cars were allowed. WPB theory was that enough motive power would make additional cars unnecessary by permitting quicker hauls and more intensive use of existing cars. This is still the theory, so that although ODT is hopeful about its 205 third-quarter locomotives, it's dubious about getting the cars.

Actually, production is running behind on the original 20,000 cars authorized last fall, and some 9,500 cars supposed to be built this quarter will actually have to be scheduled in the third. Carbuilders blame the trouble on the order issued last November by WPB's Transportation and Equipment Division forbidding any one builder to take orders for more than two types of cars. This required extensive re-shuffling of orders, and many builders didn't get their orders for steel into the mills until early in February.

Notes From the Truman Report According to the Truman Committee's report on shipbuilding, the spread between the rate of production of good and bad yards building merchant ships is too great; broad differences exist in the quality of management; we are paying for good management and the Maritime Commission should see that we get it.

There is a big dispute between WPB and Navy, who want to continue Liberty ship construction full scale, and the commission, which wants to switch to Victory ships and standard "C" ships. This row should be settled quickly.

Too Many Types Being Built Twenty-two different types of tugboats and towboats are being built by the Navy and the Army. This multiplicity of design prevents the standardization of components and should be cut down.

We had too few destroyers when the war started because necessary range required them to be big, and the 5-5-3 treaty limited our tonnage; we still do not have enough, although our program is now several times that of 1940.

Components Cut Escort Programs Destroyer escort and corvette programs were slowed by shortage of valves and propulsion machinery; Navy says the valves went to special vessels wanted by the British, and to the 100-octane gasoline program. A large part of our heavy losses could have been prevented by enough subchasers and escort vessels.

Losses to Nazi undersea attacks in 1942 averaged about 1,000,000 tons per month and in the aggregate exceeded new construction by the United States and Britain. But most of the ships sunk had delivered several loads of goods. Our increased production of tonnage, plus escort protection, will be an effective answer to the submarine menace.

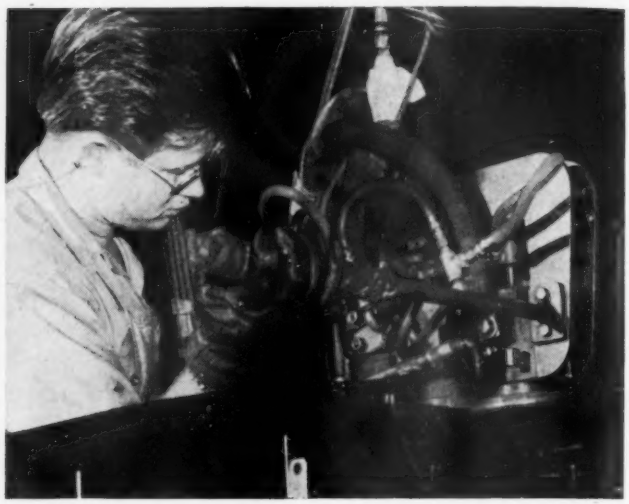
The Committee's Conclusions The committee recommends that the Navy drop its conservatism, spend less time explaining misfortunes, and develop new methods to obtain production. We need another "soap box on a raft" like the Monitor, the report says. Though Navy's production is slow, the rate is increasing each month, and "quality is extremely high."

FWA Photo by Wilson

Regardless of Age—A girl of 16 and a woman of 60 are members of the same class in a vocational school at Sidney, N. Y., built by the Federal Works Agency, as a war public works project. Both will receive six weeks instruction in machine tool operation to prepare for employment in nearby war plants. School-age pupils in these and similar schools not only attend their classes, but work in war plants from 3 to 11 o'clock each day. Much of the work done in school shops goes into war production. In some communities, shop training classes are scheduled around the clock seven days a week for both men and women to meet war plant needs

Conveyor and Special Welders Speed Tank Production

A special series welder designed by Lockheed makes a weld on a double contour surface with a rise of ¾ in. in 90 deg. of rotation. Current flowing through at two points makes simultaneous welds and 360 deg. of welding is done in 185 deg. of rotation

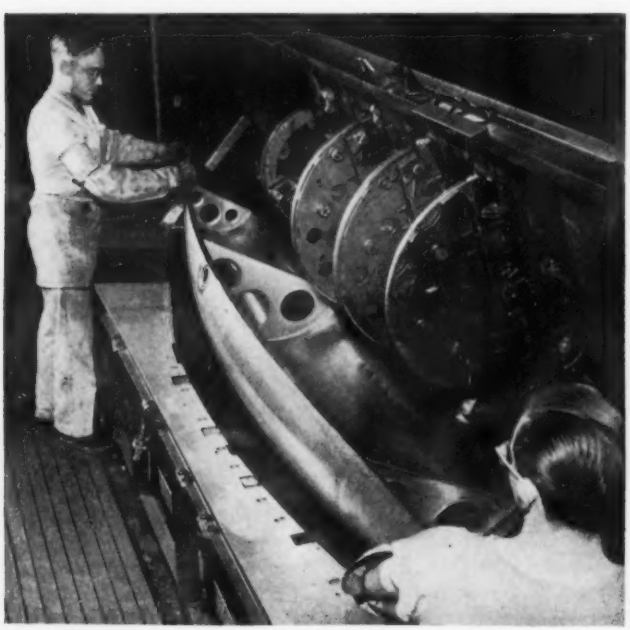


A portable seamwelder is used to assemble flanges to the fuel tanks. By having the wheels of the seamwelder rotate in the opposite direction and at nearly the same speed as that of the conveyor, the welder moves less than 18 inches during each operation

BURBANK—At one of the branch plants of the Lockheed Aircraft Corporation, streamlined, laminar flow drop tanks are being produced at a rate of one every 4½ min. Dropped from planes when emptied, they materially increase flying range. Ingenious spot, roll and seam welding, in conjunction with a specially designed conveyor system, has rushed production of these "Tear Drops for Tojo."

Each tank weighs 90 lb. empty, 1,000 lb. filled with 165 gal. of gasoline, and two of them will approximately double the normal range of a Lockheed Lightning, this country's longest range fighter. Careful attention to the aerodynamics problems attached, resulted in a design that reduces plane speed but 4 percent.

The tank, made of automobile body steel, 0.024 in. thick, was designed by Lockheed engineers at the Army's request to avoid the use of critical materials. The use of semi-automatic welding equipment on this material reduced the over-all cost to less than a sixth of aluminum tank formerly used. Two of the welders, a portable seam welder and a roll-spot welding fixture, are believed to be the first of their type constructed in this country and do much to make the record possible.



Two semi-automatic machines, of Lockheed design, weld seven bulkheads in droppable fuel tanks for Lightning P-38 and Vega Ventura. In operation, roller spotwelds, motor driven around the bulkhead arc, complete the joining operation in one minute

Seam welding joins the two halves of a droppable fuel tank at a plant of Lockheed Aircraft Corp. This operation is done at a rate of 60 inches a minute, or a total of four minutes per tank. Use of droppable tanks materially raises plane range

SPOTTING THE AIR NEWS

The East and West have met and formed National Aircraft War Production Council to facilitate cooperation and to afford unity of action. Postwar disposition of planes causes speculation. Government gets wartime rights to Mareng cell

National Aircraft War Production Council, sort of holding company for the already-existing West Coast and East Coast councils, has been formed with headquarters in Washington. Primary purpose of the Council is to expedite aircraft production by extending the borrow-and-lend program so successfully developed by the West Coast group. In Southern California, where the industry is concentrated, men, methods, materials, parts, plans and whatnot are freely exchanged. What one company is short of, another can spare. It amounts to an industrial pool, and any other time would be a violation of antitrust laws—except that it is not used to control price, negotiated by the government, nor to restrain trade. But no amount of effort can spread the efficient pooling of the concentrated West Coast aircraft community to the rest of the industry, scattered in all parts of the country.

But pooling is not all that the industry had in mind when it formed the National Council. It wanted also to be able to speak with one voice instead of two—the voices of the two Councils. The Aeronautical Chamber of Commerce, longtime spokesman for the industry, has been put away in grease for the duration, because it was geared for competition, not unlimited cooperation. The Army and the Navy and the War Production Board are constantly putting pressure on the manufacturers for more airplanes. The manufacturers feel that these agencies leave needed steps untaken, and take measures that are unnecessary. Washington did not oppose formation of the Council; rather, it lent encouragement.

Notably absent from the list of 16 companies making up the Council were United Aircraft (Pratt & Whitney, Hamilton Standard Propellers, Vought-Sikorsky) and Grumman, maker of Navy shipboard fighters and torpedo planes. United attended the meeting and is expected to join. Boeing, always a reluctant joiner, went into the West Coast group after a long holdout, and Glenn Martin himself, who played lone wolf out of the Aero Chamber till the Army pushed him in, was, until the other day, president of the East Coast Council. War makes strange bedfellows indeed, especially among aircraftmen, notorious individualists.

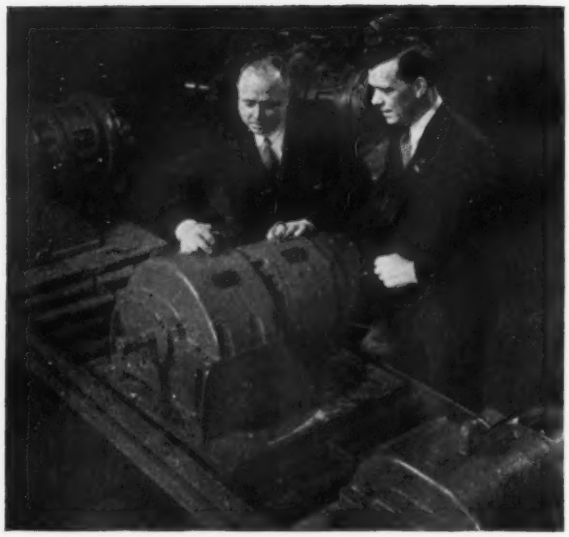
Airmen are still debating what will happen to warplanes when the war ends. All transport planes, many bombers and trainers, will be commercially useful, with more or less conversion. Airline and fixed base operators will want this equipment at a bargain; a couple of Flying Fortresses, at $1,000, would earn important money, hauling ore and mine supplies, for example. It is even suggested that low-priced surplus war planes could be used to bring down rates on mail, express and passengers. But the manufacturers will want the warplanes scrapped, to make a partial market for war-swollen plants. You can safely bet there will be barnstorming, come peace, as after World War I; *everybody* will want a dollar joy ride in a Fortress or a Liberator.

Free rights on the Mareng Cell have been given to the Government by Glenn Martin who, ironically enough, developed the idea back in 1919, only to find his own country's airplanes unacceptable for *lack* of it when the present war got going. The Mareng Cell, the rubber bullet-proof fuel tank you've read so much about, is one of Martin's most profitable patents. Full rights will be restored to him, of course, when the war ends. Martin first developed the cell as a thin-walled fuel tank, immediately after the last war. Its chief advantage then was that it could be stuffed into, or withdrawn from, its cavity in the wing, through a small opening without dismembering the wing. The present self-sealing characteristic of warplane tanks was developed by Martin and others upon request of General H. H. Arnold, chief of the Air Forces, when the British and the enemy showed up with them.

Competition for the du Pont pickup gadget, around which an elaborate feeder air mail system has been developed in six Eastern states, now shows up in the form of the helicopter. Northeast Airlines, the New England local system which recently jolted everybody, including itself, by applying for a route to Moscow (without asking Stalin), now has applied to the Civil Aeronautics Board for a certificate to serve 400 Down East post offices and rail stations by helicopter. This direct-lift machine is already sufficiently developed for operation by professional pilots. It can come down within a foot of the ground, hover and receive mail bags, without the pick-up hook, and it can take passengers—all sans airports.

Officers, directors, Army and Navy associates of the new National Aircraft War Production Council, Inc., whose membership numbers 90 percent of the aircraft manufacturing interests in this country, and whose total backlog of war orders exceeds 17 billion dollars, are shown

Seated, l. to r., are: J. Carlton Ward, Jr., president, Fairchild Engine and Airplane Corp., and Robert E. Gross, president, Lockheed Aircraft Corp., elected directors; Glenn L. Martin, pioneer airplane builder, elected president; La Motte T. Cohu, chairman of the board, Northrop Aircraft, Inc., vice president; T. Claude Ryan, president, Ryan Aeronautical Co., and Lawrence D. Bell, president, Bell Aircraft Corp., directors. Standing, l. to r., appear: Frank F. Russell, elected general manager, Dr. A. E. Lombard, Colonel Donald F. Stace, Colonel Nelson Talbott and Captain Lucian Grant.



View New Gearmotor Line—Inspecting one of the first of a new line of gearmotors to come from Westinghouse production lines are Folke Richardz, (left) manager of gear engineering, and L. R. Botsai, manager, gearing department, Nuttall works, Westinghouse Electric and Manufacturing Co., Pittsburgh

Return to Peacetime Production Concerns Canadian Manufacturers

OTTAWA — Canadian manufacturers are beginning to show concern about problems of reconversion from war production to peacetime operations. In some respects concern is greatest among some of the metal-working industries, for they figure it will take them longer than some other industries to readjust to civilian production.

Some of the anticipated problems connected with reconversion have been placed before a special Senate committee on postwar reconstruction and reestablishment, by the Canadian Manufacturers Association. Representations to the committee were based upon the results of a canvass of typical Canadian manufacturers.

Problems underscored in these representations include: (1) the difficulty of reconversion in industries in which there has been tremendous transformation or very great expansion; (2) shortage of working capital, due to expenditure of resources on the war effort, and to very heavy corporation and excess profits taxes; (3) the unfavorable relation between manufacturing costs and consumer prices, largely resulting from strict application of price ceilings to the manufactured products in the absence of corresponding control of the cost of raw materials; (4) rising labor costs; (5) the extent to which price control and other controls should be continued into the readjustment period; (6) resistance to postwar inflation such as followed the last war.

To Resume With Old Models

It was revealed that Canadian manufacturers in general plan to use the same dies, patterns and styles used in their last or current civilian production in getting back as quickly as possible to peacetime operations. Canadian manufacturers of products largely based on metal see a special difficulty for themselves, as compared with similar firms below the border, in the government order of November, 1940, which banned the production of new models. They believe they will be under a severe handicap if new models are permitted in the States and forbidden in Canada, urge modification.

Worry Over Surplus Plants

A live concern of Canadian industrialists is the disposal of government-owned plants and machinery after the war. Assurance is sought against government competition in the postwar industrial field and Ottawa is being urged to see to it that disposal takes place in an orderly manner acceptable to manufacturers who would be affected. It is also urged that facilities which have been built up for producing weapons and munitions of war be maintained in an up-to-date condition.

The emergency wartime development in Canada of a large and highly efficient machine tool industry, now supplying a substantial part of requirements, will be an important factor in reconversion. Canadian plants will not have to look to the United States and Great Britain, which will be busy on their own needs.

Heavily underscored in the manufacturers' submissions to the Senate committee is the importance of retaining and developing in Canada such industries as steel, base metals, machinery, electrical equipment, automobiles, metal-working, shipbuilding, alloy steel, magnesium and the aircraft industry. In this respect there is concern about postwar tariff policy.

Customs Raise Cost

Parts imported from the United States for war equipment being manufactured in Canada for Great Britain are no longer exempt from customs duties and taxes. Under a new ruling they are subject to the same treatment as goods imported for Canadian use. A plan is being worked out for the compensation of war contractors whose prices were based on the exemption of these parts from duties and taxes. Although the form of compensation has not been determined it will probably be that of an increase in price corresponding to the amount of the levies.

MSD OPENS MONTREAL OFFICE

OTTAWA—To centralize most of its activities in that area, the Munitions and Supply Department has opened a Montreal office at 1155 Bishop Street, it was announced by Hon. C. D. Howe.

This centralization is designed to increase the efficiency of operation and to facilitate the relations between the Department, its contractors, and the public.

The various branches and controls of the Department to be represented in the new central office in Montreal are as follows:

Aircraft Production Branch, Ammunition and Gun Production Branch, Central Inventory Records Division, Conservation Exhibit, Defence Projects Construction Branch, Construction Control, Industrial Security Branch, Priorities Branch, Shipbuilding Branch, Signals Production Branch, Steel Control, Service Division of the Office of the Coordinator of Production, Automotive and Tank Production Branch, and Transit Control.

Highway Ups Production

VANCOUVER, B. C.—With the development of the Alaska Highways, Edmonton has become one of the boom cities of Canada. In the earlier stages of the war Edmonton secured comparatively little revenue from any war source but today this entire situation has changed. Industrial plants in Edmonton are participating to an enormous degree in the war effort, producing both in connection with the Alaska highways project and under the Bits and Pieces program of the Dominion Government.

The machine shop industry in Edmonton was comparatively small at the outbreak of war but now these shops are employing approximately 500 men, a small figure when compared with the huge production of some factories but an enormously increased figure over peacetime employment in such industries.

Other Edmonton plants, including foundries, also are busy on war work, either directly or indirectly.

BUSINESS ITEMS

Bantam Bearings Corp., South Bend, Ind., a subsidiary of Torrington Co., Torrington, Conn., for the past eight years, has been merged with its parent company and will be known as the Torrington Co., Bantam Bearings Div. It will retain its present personnel and continue operations from the South Bend headquarters.

Copperweld Steel Co., Warren, Ohio, has announced the opening of a new sales office at Indianapolis. M. A. Williams has been named district sales manager with headquarters in the Circle Tower. The territory includes central and southern Indiana, southwestern Ohio and the state of Kentucky.

Dow Chemical Co. has recently begun operation of a new government owned magnesium plant in Michigan. Opening ceremonies included a dinner at the Detroit Statler Hotel and the pouring of the first ingot of magnesium in the new plant.

Algoma Products, Detroit, has been formed for the manufacture of templet dies for aircraft and similar industries as well as fixtures. The company has taken over the former plant of the Weltronic Corp. at 3080 E. Outer Drive, and is also operating a second plant in the Detroit area. L. Hoster, general manager, was formerly in charge of manufacturing for Progressive Welder Co. Emil Hansen, previously purchasing agent of Weltronic Corp., has been placed in charge of purchasing. The new company has taken over the former fixture division from Weltronic.

Pratt & Whitney Aircraft Div. of United Aircraft Corp. is operating a new plant at Southington, Conn. Most of the equipment is being moved from the East Hartford plant along with twelve production departments.

Mid-West Abrasive Co., Detroit, has established a free engineering and laboratory service through which ordnance makers and other manufacturers of mechanical parts may obtain precise readings on flatness and profile. The new service is designed primarily to assist such manufacturers who have to meet rigid government specifications on finish and tolerances, and is offered to companies which require such readings and do not have measuring equipment on hand. Parts should be shipped to the company's engineering department at 1960 E. Milwaukee Ave.

Wheelco Instruments Co., Chicago, makers of temperature indicating, recording and control devices, has made three additions to its sales and service staff. Hugh Acock, formerly in the Tulsa territory, has been named Texas district manager with headquarters in Houston. C. H. Garrison is in Kansas City representative, with a territory including western counties of Missouri; and Russell George has been added to the sales and service department of the Combustion Safeguard Div., with headquarters in Chicago.

Talon, Inc., Meadville, Pa., makers of Talon slide fasteners, has purchased controlling interest in the Electroweld Steel Corp., Oil City, Pa., where the production of steel tubing will continue.

Position Changes Announced at Cleveland Automatic

A. L. PATRICK

G. V. PATRICK

NAMES in the NEWS

James Hammond, formerly chairman of the board of Cleveland Automatic Machine Co., has become president and treasurer succeeding A. L. Patrick who has retired as president at the age of 71. Mr. Hammond has been associated with the company since 1941. Mr. Patrick has been named chairman of the board. G. V. Patrick has become executive vice-president.

Peter Rossmann

Peter F. Rossmann, chief of development research in Curtiss - Wright Corp., Airplane Div. research laboratory, has been appointed general manager of a new division known as the Development Division to be located in New Jersey, and will make his headquarters offices in the East. Mr. Rossmann came to the Airplane Div. of the corporation from Packard Motor Car Corp. in 1936 and has held the executive positions of head of the production design department, assistant to the director of military engineering and technical assistant.

Thomas W. Dinlocker was elected vice president and treasurer of SKF Industries, Philadelphia manufacturer of ball and roller bearings, at a recent meeting of the board of directors while Richard H. DeMott has been named vice president in charge of sales.

Claude J. Neville, formerly vice-president and works manager of C. O. Bartlett & Snow Co., Cleveland, manufacturers of materials handling and processing equipment, has been named vice-president and treasurer. Henry A. Christy has been advanced to works manager from the position of superintendent which he has held since 1936, succeeding Mr. Neville in that capacity. Mr. Neville joined Bartlett & Snow in an engineering capacity in 1906, while Mr. Christy became associated with the firm in 1923 in a production capacity.

Position Changes at Bartlett & Snow

Claude J. Neville

Henry A. Christy

Named Vice Presidents at Formica Insulation Co.

R. W. LYTLE

GEORGE H. CLARK

E. G. WILLIAMS

T. M. Cummings, vice president of Progressive Welder Co., Detroit, since the company was founded in 1933, has been appointed executive vice president and general manager. He has been in charge of manufacturing and engineering development as well as sales development for the company.

C. W. Higbee

C. W. Higbee has been made manager of the newly organized wire and cable department of United States Rubber Co., New York City. He has been associated with the organization since 1919, starting in the wire sales department at Bristol, R. I., where he later became factory superintendent. Subsequently Mr. Higbee was assistant manager and then manager of wire sales.

W. J. North

W. J. North, formerly factory superintendent for Packard Motor Car Co. at Detroit, has been appointed works manager of J. G. Brill Co., Philadelphia, makers of railroad cars and trucks. From 1927 to 1940 Mr. North was works manager for Briggs Body Corp. and spent three years organizing the English plant. In 1940 he resigned from Briggs to take charge of production at Packard Motor Car Co.

George H. Clark has been named vice president in charge of engineering of Formica Insulation Co., Cincinnati. He has been connected with the company for 18 years and is a well known laminated plastics engineer. R. W. Lytle, associated with the company for 20 years, has become vice president in charge of special automotive and aircraft engineering. Ellsworth G. Williams, formerly employed in a consulting capacity for the past three years, has become vice president in charge of manufacturing. Harry Grunewald, associated with Formica for twelve years, has been named factory manager.

R. S. Elberty, Jr., 120 E. Broward Blvd., Fort Lauderdale, Fla., has engaged in business as a consulting engineer. Mr. Elberty is a development engineer specializing on design and styling of machinery and electrical drives for automatic operation. Until recently Mr. Elberty was connected with T. W. & C. B. Sheridan Co. as experimental engineer. For several years prior to that he was associated with Landis Tool Co., Waynesboro, Pa.

Consultant

R. S. ELBERTY, JR.

OBITUARIES

Charles A. Schranz, 68, manager of the machinery department of R. D. Wood Co., Philadelphia, makers of hydraulic machinery, presses, valves and other products, died at his home in Wynnewood after a short illness. Mr. Schranz joined the company in 1905 as an engineer, specializing in the design of gas holders, gas producers, pumping equipment and hydraulic machinery. In addition to his position with the Wood company, which he held for the past 25 years, he was also a director of the Florence Pipe Foundry & Machine Co. of Philadelphia.

R. L. Patterson, 70, chairman of the board of American Machine and Foundry Co., Brooklyn, N. Y., manufacturers of machinery used in the tobacco industry, passed away following a brief illness. He organized the company in 1900 and was president until 1941. Mr. Patterson invented several machines used in this industry.

Edmund Burke, 65, industrial engineer of River Forest, Ill., died in Chicago recently. He was employed until 1940 by the Crane Co., Chicago, plumbing and heating supplies, valve and pump manufacturers, when he founded Edmund Burke Engineering Sales Co.

Daniel E. Hamill, 68, superintendent of the gear department at General Electric Co., Lynn, Mass., for 40 years, passed away.

Vernon B. Chase, 47, died recently. He had been president of Metal Specialty Co., Cincinnati, and previous to transfer to the home office several years ago had represented the company in Detroit.

MEETINGS

American Management Assn. Production Div. Meeting. Hotel Statler, Cleveland, Ohio. May 5-6.

American Gear Manufacturers Assn. Annual meeting. Westchester Country Club, Rye, N. Y. May 17-19.

National Metal Trades Assn. Production conference. Palmer House, Chicago, Ill. May 26-27.

American Iron and Steel Institute. Annual meeting. Waldorf-Astoria Hotel, New York, N. Y. May 27.

American Electroplaters' Society. Annual meeting. Hotel Statler, Buffalo, N. Y. June 7-9.

American Society for Testing Materials. Annual meeting. Hotel William Penn, Pittsburgh, Pa. June 28–July 2.

SHOP EQUIPMENT NEWS

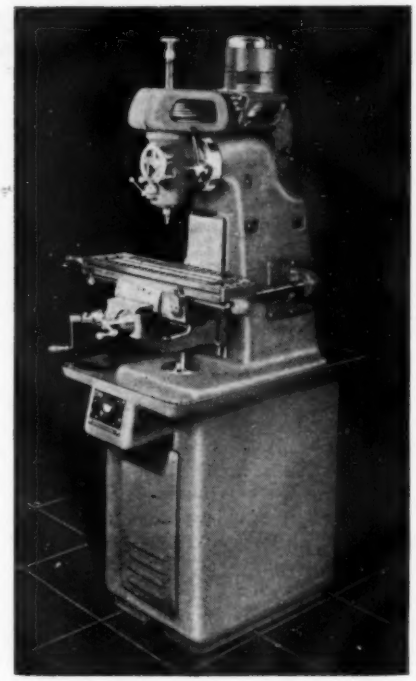
Industrial Vertical Milling Machine and Jig Borer Has Speeds for Machining Wide Group of Materials

Design of the No. 0-9 combination vertical milling machine and jig borer, introduced by Industrial Tool & Die Works, Inc., Minneapolis, Minn., provides a convenient working table height. Six spindle speeds ranging from 300 to 3,800 r.p.m. are available to accommodate the milling of many kinds of material from tough steel to aluminum.

The table has a 12-in. longitudinal travel, and a 6-in. hand cross travel. Its working surface is 24×6 in. and has three 7/16 in. T-slots. The four table speeds range from ¼ to 1⅛. The table feeds in both directions, and operates either by hand or ¼-hp. motor, controlled by a single directional control lever. Hand feed is accomplished by the table feed handwheels which are equipped with graduated micrometer dials. Maximum distance from the spindle nose to the top of the table is 8 in.

The cutter spindle, having a No. 7 B.&S. taper hole, is mounted in a movable quill fitted in a vertical spindle. An independent ½-hp. constant-speed motor drives the spindle head which is built to swivel 180 deg. A 3-in. vertical adjustment of the quill is accomplished by a hand lever that actuates a gear meshing with a rack cut integral with the quill. The quill adjusting lever is fitted with an adjustable limiting stop for positioning of the cutter.

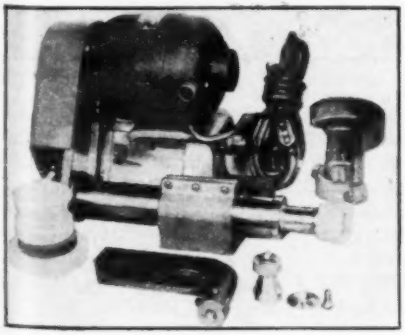
This milling machine is equipped with a built-in cutter coolant pump



mounted on the inside of the bed and driven by chain from the table feed power shaft. The coolant returns through strainer holes to the reservoir in the base. The machine occupies a floor space 38×34 in., and height from floor to the support pads for the machine at the top of the base is 30 in. Net weight is 850 lb.

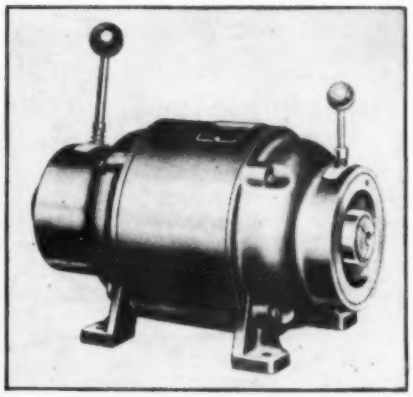
Lempco Small Toolpost Grinder Has Special Quill Adjustment

A small heavy-duty grinder for internal, external, face and taper grinding on a lathe, shaper, planer, miller or bench, designated as Model TPG, has been introduced by Lempco Products, Inc., 5700 Denham Road, Bedford, Ohio. This universal type toolpost grinder is suited for grinding holes 8½ in. deep. An exclusive Lempco quill adjustment provides the equivalent of two different length quills because the motor may be shifted 2 in. on a slide bracket. The grinding quill is likewise adjustable. Two-step V-pulley provides spindle speeds from 6,000 to 13,000 r.p.m. The universal type motor is suitable for alternating or direct current, 25, 50 or 60 cycles, single phase.



Crozier Polishing Lathe Permits Maximum Capacity Use

A polishing lathe that incorporates a clearance hole through the entire machine is now being produced by Crozier Machine Tool Co., Hawthorne, Calif.



This feature permits polishing a portion of a long piece of work up to the maximum capacity of the lathe.

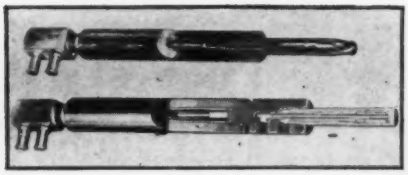
A double-face cam operating mechanism provides positive opening and closing of the collets. Work can be loaded and unloaded while the spindle is in rotation. A switch and mechanical brake control makes the machine adaptable to work which can be loaded better when the spindle is stationary. This control lever first cuts off the power from the motor and gradually applies a molded disk-type brake facing against a cast-iron flange. This lathe is offered in 14 models varying in capacity.

Frostpoint Welding Electrode Has Removable Frostcap Tip

Development of the Frostpoint resistance welding electrode has been announced by Frostrode Products, 19003 John R. St., Detroit, Mich., for refrigerated welding. The electrode is suited for use on any existing welder.

The unit features a Frostcap replaceable tip, which can be quickly removed without disturbing the body of the electrode. The use of integral fins in the Frostcap provides strength which permits a decrease in wall thickness of the entire cap and at the same time increases heat dissipation to the coolant.

Flow to the cap is through a coolant guide, which is positioned in the Frostpoint in such a manner as to insure constant spacing between guide opening and inside face of the cap. The return flow is through a large number of parallel passages, allowing greater area of metal to come in contact with the coolant and thus further increasing heat dissipation. To replace the cap when necessary, it is gripped in a pair of electric pliers available from the company. This frees the cap from the electrode by

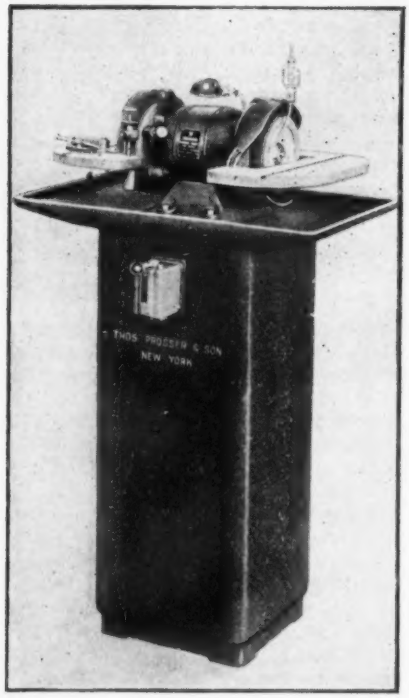


melting the solder seal. To facilitate interchange of different electrode sizes on the same machine, the barrel of the Frostpoint is provided with a hexagon section at one point.

Prosser Carbide Tool Grinder Has Quick-Acting Index Device

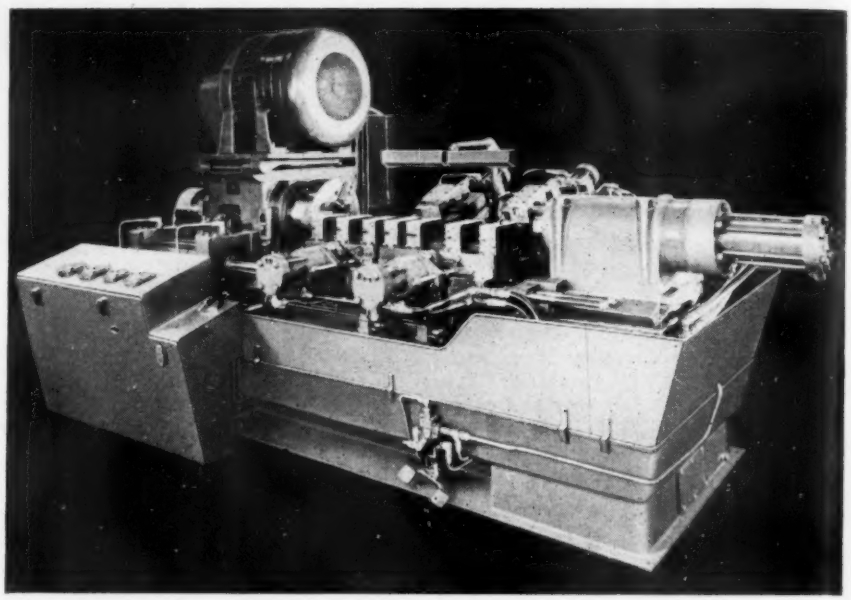
Among the features of the Model AA floor type carbide tool grinder, developed by Thomas Prosser & Son, 120 Wall Street, New York, N. Y., are a heavy base, tables, storage compartments for wheels and tools, and a drum type on-off-reverse switch. The machine provides for rapid removal of metal when roughing. Either silicon carbide or diamond wheels for grinding carbide or aluminum oxide wheels for grinding Stellite for high-speed steel can be used.

A quick-acting indexing device permits instant setting of the table to the desired angle, and stays in place at the angle to which it is set. The machine carries oversize 7 in. wheels.



Various attachments can be furnished for the machine, such as a device for grinding carbide or high-speed steel drills of various sizes, and a simple arrangement for the grinding of lips in the surface of the tool to curl or break the chips when turning steel. The face of the wheel can be kept close to the edge of the table, and the wheels can be used up practically 100 percent.

Sparks Makes Special-Purpose Hydra-Feed Lathe for Speeding Production of Many Types of Work Pieces

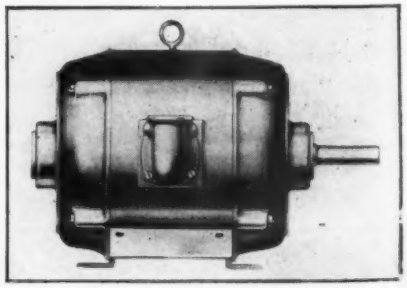


For mass production of many types of work pieces such as shell, tank parts, automotive and aircraft parts, Sparks Machine Tool Corp., 32-34 Main St., Norwalk, Conn., has introduced a special-purpose semi-automatic, Hydra-Feed lathe. By specially designed tooling set-ups, many other jobs can be handled. All tool movements are hydraulically operated and controlled. The sequence of operation and returns is automatic. A four-speed headstock has been provided to give spindle speeds for various types of tools and work materials. The front spindle bearing on the headstock has a diameter of 7 in., and the rear spindle bearing diameter is 4½ in.

The work is held in a live tailstock center mounted in ball and roller bearings in a retractable tailstock quill. The work cycle is started by manual operation of a tailstock quill clamping lever which automatically engages the spindle clutch. Release of the lever at the end of the cycle automatically applies a brake to stop spindle rotation. Operation of the chuck and quill is accomplished by pressing the treadle valve. After releasing the quill lock and operation of the treadle valve, the machine is ready for the new piece. The tailstock quill diameter is 6⅞ in., and the quill has a stroke of 8 in.

This machine has a 21-in. swing over the ways and 12-in. swing over the carriage. The lathe can be furnished in either a bed length of 7 or 9 ft. The height from floor to center of the spindle is 37 in. Motor sizes available are 15 to 60 hp. Coolant pump capacity ranges from 25 to 30 gal. per min. Since the hydraulic system and the coolant system are individually motorized, no energy is drawn away from the spindle drive. The machine occupies a floor space of approximately 10×4 ft.

R. & M. Uni-Shell Motor Line Made for Interchangeable Use



A line of Uni-Shell electric motors has been developed by Robbins & Myers, Springfield, Ohio, in which all motor types in any one frame size are interchangeable. The line includes polyphase induction motors made in 1 to 30 hp. sizes; capacitor start, single-phase induction motors, made in 1 to 5 hp. sizes; standard direct current motor and generator, made in 1 to 7½ hp., or ¾ to 5 kw. sizes; and repulsion induction motors made in 1 to 5 hp. sizes. In any one frame size, the shell dimensions, head fit, bolt circle holes, shaft size and conduit box mountings are identical for all types.

Standard on all ball bearing motors is the double-row-width bearing with a large grease reservoir, and complete seals on both sides held in place by removable snap rings. The lubricant is sealed against dirt. Adequate insulation has been provided to minimize danger of breakdown. Three grades of rotor balance are available on all types of these Uni-Shell motors; namely, static, commercial dynamic, and special dynamic balance.

"Switch" to STANDARDS

—and Keep MORE Carbide Jobs Running With LESS Reserve Stocks!

The planned use of *standard* styles of carbide tools and blanks, in place of made-to-order "specials", can bring these important benefits to your plant:

With *standards* you can meet your carbide tool demands more promptly.

With *standards* you can reduce your carbide tool inventory (and still maintain normal tool crib service—even with an increasing use of carbides).

With *standards* you can fill most emergency requirements usually the *same day* the need arises.

Here is the way to obtain the benefits of carbide tool standardization in your plant:

TAKE THESE THREE STEPS TOWARDS STANDARDIZATION

1 Check your made-to-order carbide tools against *standard* carbide styles. You'll find that just 10 *standard* styles—used either "as is" or quickly adapted by grinding to special shapes—can be used for 50% to 75% of your jobs.

2 Check your carbide tool stocks. With *standards*, you'll no longer need individual reserves for each of hundreds of special styles. Instead, you'll have a flexible master stock based upon not more than 10 *standard* styles.

3 Check your carbide tools that MUST be "specials." Although the tool is special, the blank can often be *standard*. Keep a small master stock of those *standards;* braze them on your tools or cutters the same day the need arises. No "delivery" delays.

CARBOLOY COMPANY, INC.

Sole makers of the Carboloy brand of cemented carbides

11149 E. 8 MILE BLVD., DETROIT, MICHIGAN

Birmingham, Ala. • Chicago • Cleveland • Los Angeles • Newark • Philadelphia • Pittsburgh • Seattle

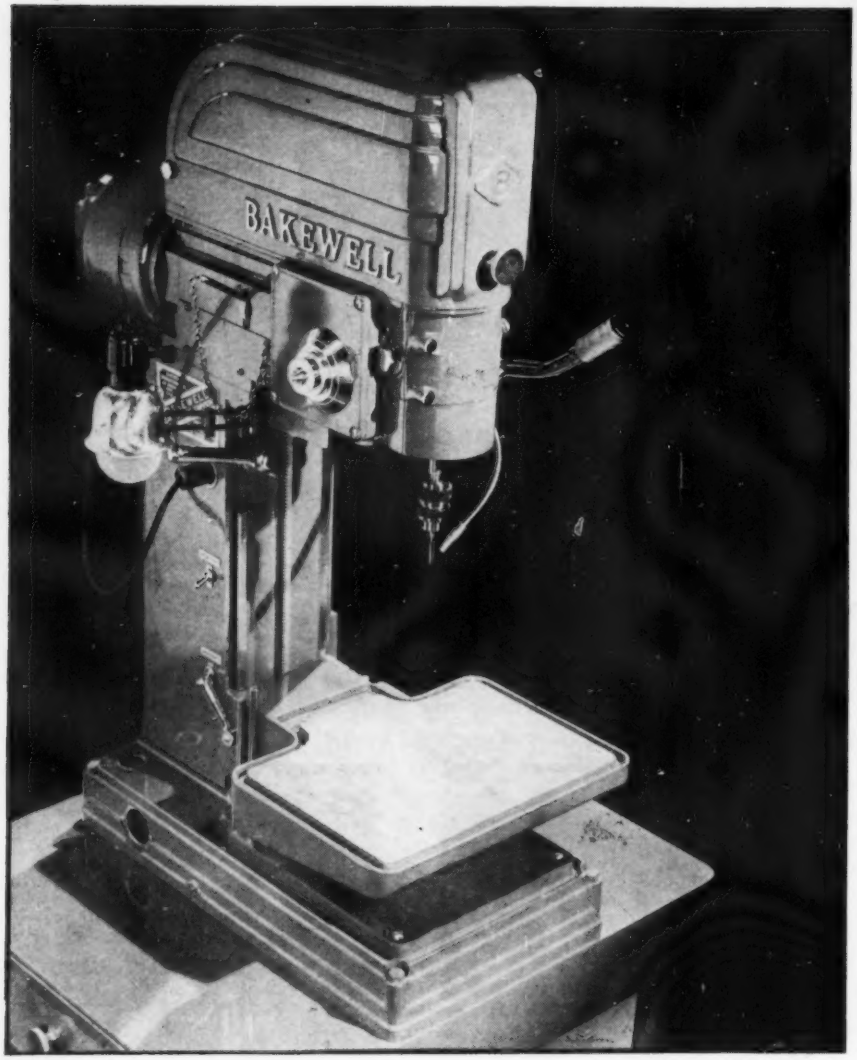
Canadian Distributor: Canadian General Electric Co., Ltd., Toronto, Canada

√ Standard Catalog GT-142 on request

CARBOLOY TRADEMARK **CEMENTED CARBIDES** TRADEMARK

TOOLS • DIES • DRESSERS • MASONRY DRILLS • WEAR RESISTANT PARTS

Bakewell No. 0 Precision Tapping Machine Performs Tapping and Threading in One Pass



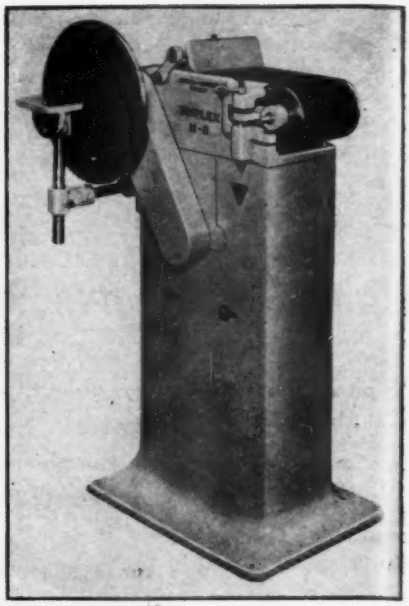
A No. 0 precision tapping machine has been developed by Bakewell Manufacturing Co., 2023 Santa Fe Ave., Los Angeles, Calif. Tapping and external threading of Class 2, 3, 4 and 5 gage fits is accomplished in one pass of the tap. The machine is made for bench mounting, with a pedestal provided for floor mounting if desired. Electrical controls operate on 110 volts through a transformer installed on the panel. Starting is by means of either a push-button on the spindle advance lever or by a foot switch.

Tapping is controlled by a precision leadscrew mounted on the upper end of the spindle. Brass fingers take the place of the usual leadnuts and are clamped in the toggle arms which are electro-magnetically controlled. The spindle has a 2 in. stroke; maximum depth of tapping is 1¼ in. Spindle speeds of 400, 800 and 1,750 r.p.m. are available.

Power is delivered to the spindle through two V-belts, one for tapping, the other for backing out. The spindle is reversed by means of a solenoid-controlled clutch, and limit switches assure accuracy of depth to within 0.005 in. Throat clearance is 8½ in., and vertical clearance is 9 in. maximum to 1 in. minimum. The working surface of the table is 9½×12 in.

The hardened leadscrew is provided with a tap section at the upper end whereby threads can be generated in the brass fingers. This combination provides means for reconditioning the fingers or cutting new threads where the pitch is to be changed. A safety clutch is provided on the machine as well as an emergency control for quickly reversing the spindle in the event of stalling.

The No. 0 tapping machine has a capacity of No. 0-80 to No. 10-24 in brass, aluminum or magnesium, and No. 0-80 to No. 10-24 in brass, aluminum or magnesium, and No. 0-80 to No. 0-80 to No. 8-32 in steel or tough bronze. The ball-bearing ¼-hp. motor is furnished for either 220 or 440 volts, 3-phase, 60-cycle. An upper coolant tank has capacity of ⅛ gal. and the tank in the base a capacity of ½ gal.



Walls Band and Disk Grinder Does Grinding and Finishing

The Duplex-M-6 abrasive band and disk combination grinder of pedestal type has been introduced by Walls Sales Corp., 96 Warren St., New York, N. Y. This machine permits the rough grinding to be performed on the disk and the finishing operation on the abrasive band, thus combining the operations of two machines in one unit. The grinder has a ¾ hp. motor, with a speed of 1,450 r.p.m., fully inclosed V-belt drive, balanced steel pulleys, dustproof ball bearings, Alemite lubricating system, and grease gun.

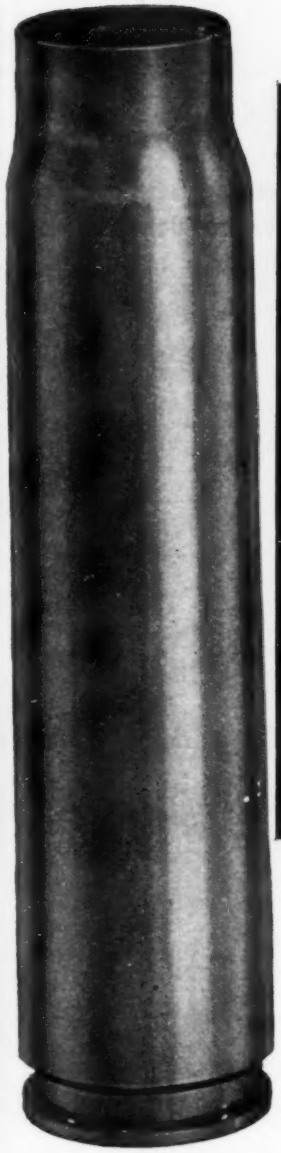
Band tension is automatically controlled by a positive acting tension spring arrangement, and a single-action thumb screw assures true belt alignment. A bevel attachment close to the grinding table is adjustable at any angle. The machine has a removable steel disk, also a disk grinding table which is adjustable.

The band grinding table is 7¾×14 in., while the disk grinding table measures 3½×5 in. Diameter of the disk is 14 in. The grinder occupies a floor space 20×22 in., and weighs 500 lb.

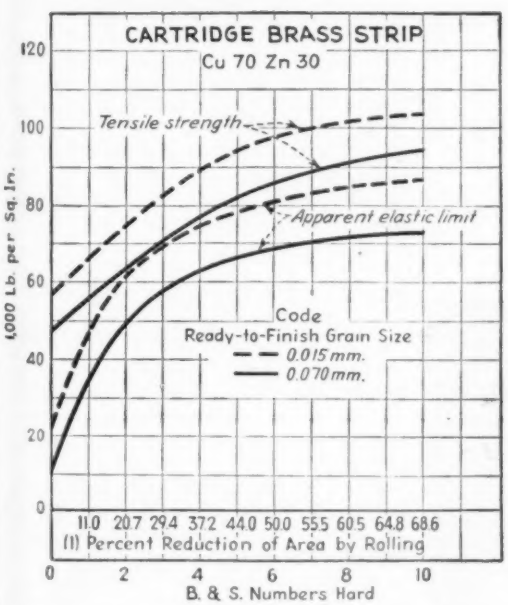
Michigan Chart Recorder Checks Tooth Form Variations

Michigan Tool Co., 7171 East McNichols Road, Detroit, Mich., has introduced the Model B automatic checking recorder for use with Michigan sine-line lead and involute checkers, which makes permanent chart records of involute tooth forms and leads. It can be utilized to record variations in dimensions of thread forms, to surface checking with parallels and to many other checking operations.

Operation of the recorder is based upon the use of synchronous devices. One is located in the recorder and another installed on a bracket in the



Grain size is important in CARTRIDGE BRASS



As shown by this chart, control of the ready-to-finish grain size is necessary if uniform physical properties are required in the finished metal.

Most users of cartridge brass know that it has the most favorable combination of ductility and strength of all the brasses, that it can be readily spun, drawn, forged and upset. But many have discovered that even a metal so obliging can have a distinct "personality" of its own which has a bearing on methods of fabrication.

For example, its mechanical properties are markedly influenced by the ready-to-finish grain size — the crystal size obtained by the anneal before the final cold working operation. The chart shown here helps to illustrate the extent of this influence, and the effect of cold working, on the tensile strength and apparent elastic limit of cartridge brass strip, for the smallest and largest grain sizes commonly met in commercial annealing.

This is but a single example of the kind of information with which Revere is prepared to supply users of metals. It is one reason why persistent fabricating problems seldom trouble Revere customers. For copper-base alloys and practical help in using them, get in touch with Revere today.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

Executive Offices: 230 Park Avenue, New York

Sales Offices and Distributors in Most of America's Major Cities

base of the gear checker, or other type of measuring device. Any motion imparted to the checker is automatically multiplied and duplicated in the recorder by electrical connections between the two units.

The chart drive may be either coupled in synchronism with the moving spindle or table of the measuring device, or it may be driven independently by means of a separate synchronous motor at predetermined speeds. Speeds of ¼ and ½ in. per sec, are provided when the independent synchronous motor is used to drive the chart. Movement of the indicator pen on the chart is magnified in the ratio of 0.0001 in. to ⅛ in. The over-all width of the chart paper permits dimensional variations up to 0.002 in. either side, plus or minus, of a central 0 line to be recorded.

Three switches are mounted on the control panel, and a control lever for selecting the drive speeds when the chart is driven by the constant speed motor is provided at the top of the machine.

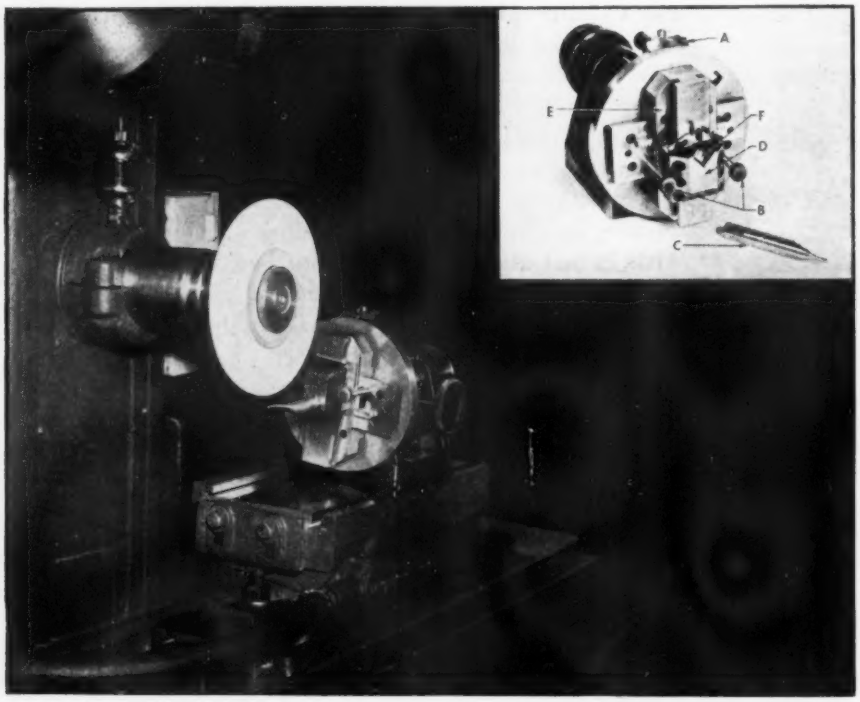
The recorder is mounted on rubber tired casters and operates on standard 110 volts, single-phase alternating current.

Perfex Radius Dresser Dresses Wheel at Bottom

Development of a horizontal type angle to tangent radius dresser by Perfex Gage & Tool Co., Detroit, Mich., deviates from the commonly accepted method of dressing from the side of the wheel. With this type it is possible to dress the wheel at the bottom where the grinding operation actually takes place. This feature also allows the wheel dressings to be thrown away from the dresser into the dust collector, instead of onto the dresser.

Another advantage of this dresser is the way in which the diamond point is automatically set on center. This is accomplished by the feature of the dressing tool mounting, shown at *F* on the tangent slide *E*, ground with a 90-deg. V. When the diamond shank *C* is placed in position on the V mount block, it automatically places the diamond point in perfect center. The radius adjustment shown at *D* is provided with two stop pins indicated at *B*.

With this equipment it is possible also to dress a 0.050 radius to a half-circle without additional equipment. To insure a true radius, a direct reading from the base to the diamond can be obtained by using a gage block set-up. The construction of this dresser also permits the use of a vernier, illustrated at *A*, to insure accuracy of angles that the ordinary vernier cannot calibrate.



Aero Automatic Rivet Bucker Requires Only One Operator

To buck and rivet in one operation, the Aero Tool Co., Burbank, Calif., has introduced a bench model automatic rivet bucker. The tool uses a standard rivet set that is synchronized with an air cushioned bucker. Treadle control enables the operator to have both hands free. No predetermined setting is required even with varying lengths of rivets. When the rivet set contacts the rivet, the bucking bar is always against the shank.

The bucker has a 15 in. throat, with other sizes available. The yoke is made of ⅜ in. steel and is stressed to prevent deflection. All parts except the yoke are interchangeable with the portable model. A button-type gun is used, and the bucker can be supplied with or without the gun.

Hampton Arc Welding Machine Designed for General Use

Hampton Electric Manufacturing Co., 314 Archie St., Oakmont, Pittsburgh, Pa., has developed the Model G alternating current arc welding machine for general use. It operates on voltage of either 220 or 440 volts, and has a welding capacity from 30 to 300 amp., and can be operated continuously at 225 amp. By turning a crank at the top of the machine, which can be done while welding, the current can be controlled for an infinite number of welding heats between minimum and maximum.

This machine is equipped with a

AFTER CUTTING OILS—WHAT?

A statement of tremendous interest to everyone engaged in metal working

SINCE OIL first replaced water as a tool coolant many years ago, the development of various compounded oils and water emulsions has helped make possible present day mass production. However, we at Quaker Chemical Products Corporation were convinced that the cutting fluids now in general use represent only one step — a comparatively early step — in the continuing evolution of tool coolants. We, therefore, determined long ago to anticipate the *next* step.

In our superbly equipped research laboratories a picked staff of chemical engineers went to work to find out just how and why a cutting fluid works.

Lubricity—What Is It?

Every liquid, of course, possesses some degree of "lubricity" — the ability to form a protective film against friction — but we wanted to learn much *more* than this fixed definition. Once we learned the "how" and the "why," we would know the fundamental *causes* of known results. This, we felt, would give us the basis for developing something startlingly new.

Now, as our research advances, we realize more than ever how much there is yet to be added to the total knowledge of the subject. But our men have already uncovered many facts which have enabled us to develop *new types* of chemical fluids for use in metal machining.

Some of these new type products are now producing sensational results in actual large scale production . . . helping to turn out more and finer finished parts for the tanks, planes and guns needed by our armed forces.

Can Straight Cutting Oils Be Replaced?

These new materials are synthetic, organic compounds that form permanent emulsoid solutions. They act as *polar* emulsions and actually plate-out on the metal a lubricating film that is far more tenacious than oil. *These solutions can be used wherever straight cutting oils are used,* except in cases where water might affect bearings of certain machines. This is, of course, only a mechanical limitation.

Think of a mixture of chemicals and water producing better — yes, *better* — results than sulphur fatty oils on difficult machining jobs such as broaching, deep drilling, milling and similar jobs! Seems almost incredible, doesn't it? Yet, when you consider that the lubricating film is more adhesive than oil and that the superior refrigerating qualities of water are utilized, it is easier to understand how these new type products not only can replace straight cutting oils, but can actually permit tools to run for longer periods between grinds. Being water solutions, they are also a great deal more pleasant to work with than are oils.

Production Data Now Available

For the benefit of production men who are interested in keeping abreast of developments resulting from Quaker's research, we have prepared authentic technical data sheets. Some contain facts on the appearance, characteristics, use and application of new products. Others give specific data on various machining jobs — actual plant production reports by Quaker Process Engineers. All are yours for the asking.

Quaker Process Engineers are located in leading industrial centers. They are trained technical men who have had years of experience in metal processing plants. Before they came with us they "cut their eye teeth" as chemists, metallurgists, methods engineers or superintendents of industries such as yours. They talk your language and know how to translate our new developments into increased production.

Should you be interested in knowing just what our new type coolants can do to help you handle a difficult metal cutting problem — or possibly to increase machine production throughout your plant—drop us a line. A Quaker Process Engineer will be glad to sit down and talk shop with you.

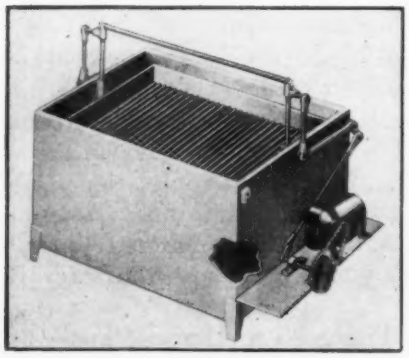
QUAKER CHEMICAL PRODUCTS CORP.

CONSHOHOCKEN, PA.

OTHER PLANTS: CHICAGO AND DETROIT — WAREHOUSE STOCKS IN PRINCIPAL INDUSTRIAL CENTERS

thermostatically controlled, mercury cut-out switch for protection against excessive overloads. A stabilizer in the welding circuit controls and balances the voltage and current across the arc, thus decreasing spatter and assuring a homogeneous weld.

Any alternating current electrode from 1/16 to ¼ in. inclusive can be used for either horizontal, vertical, or overhead welding. For portable use, the machine is fitted with handles, and mounted on ball-bearing castors. The unit measures 16½×23½×28 in. and weighs 325 lb.



Simplex Metal Parts Washer Has Lever-Operated Tray

Simplified operation is a feature of the Simplex metal parts washer brought out by by Sturdy-Bilt Equipment Corp., West Allis, Wis. A lever operated by an electric motor lowers and raises the material tray into and out of the soaking tank. After loading the tray, operation of the unit is started by pressing a switch. The swishing action into and out of the solution provides a soaking and washing action that removes foreign matter. Either hot or cold solutions may be used.

The tank is fully insulated and the cleaning solution is heated to a temperature of 120 to 130 deg. by means of steam, electricity or gas. Three sizes of this metal parts washer are available, 36×24×36, 48×36×36 and 60×48×36 in., with capacities of 130, 265 and 450 gal. respectively. Simplex units can also be used for preparing metals for further machining, for plating and enameling.

Mot-O-Trol Electronic Adjustable-Speed Drive Provides 20 to 1 Speed Range From A. C. Source

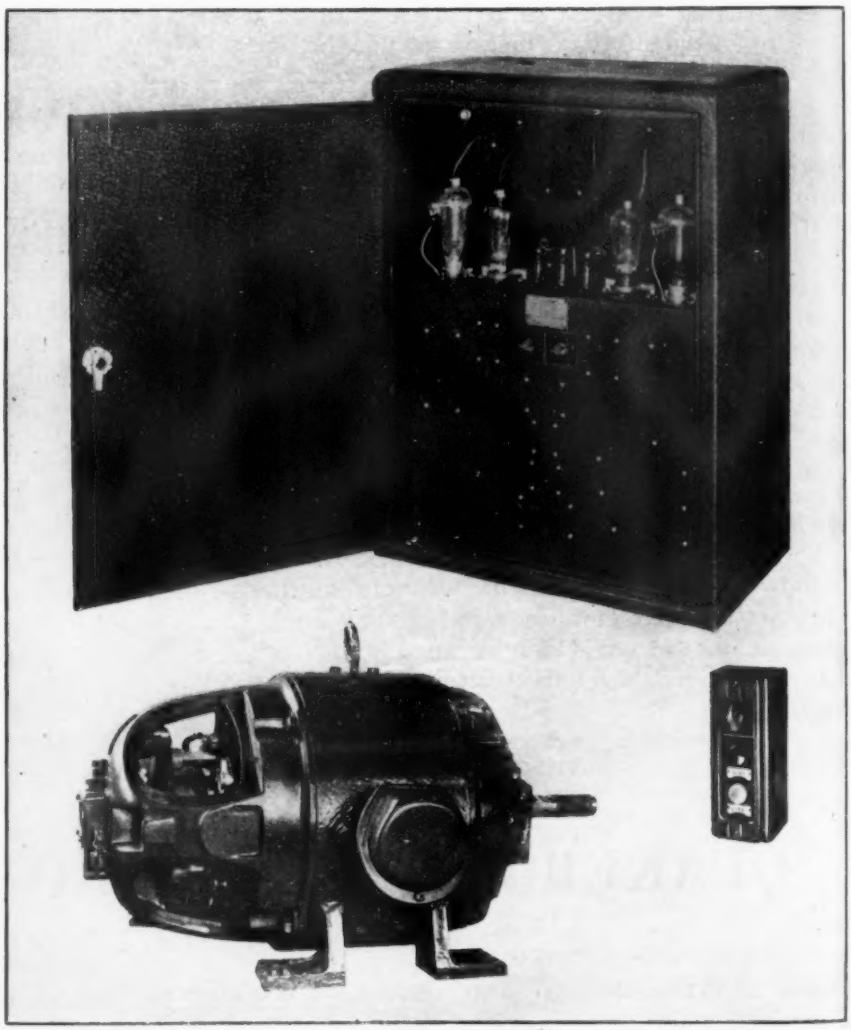
The Mot-O-Trol electronic adjustable-speed drive has been developed by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., for application on industrial drives, such as machine tool feeds, fabricating and converting machinery, winding reels and conveyors. It provides speed regulation over a 20 to 1 speed range for direct current motors operating from an alternating current source. The incoming alternating current power is converted by grid-controlled rectifier tubes and supplied to the armature and field of the direct current motor.

This electronic drive includes such features as stepless speed control, full torque at extremely low speeds and automatic close speed regulation over wide load fluctuations. The direct current voltage output of the main rectifier tubes is controlled by small tubes to compensate for speed changes. Additional rotating parts, separate line starters or field rheostats are not necessary. The drive has four parts: Power transformer for separate mounting, the Mot-O-Trol cabinet with the thyratron tubes and the current limiting and speed regulating control, control station with potentiometer to vary the voltage supplied to the armature and field circuits, and a shuntwound direct current motor.

When mercury-vapor tubes are used, an initial five minute time delay period is required for tube warm-up. This time delay need occur only once, however, after the line switch is closed. The control is designed to maintain continuous heating of the tubes at all times, even when the motor is stopped, unless the line switch is opened or the low voltage protection feature operates. The time delay relay contacts are in the field and armature control circuits so that the forward and reverse pushbuttons are not effective until the initial warm-up period is over.

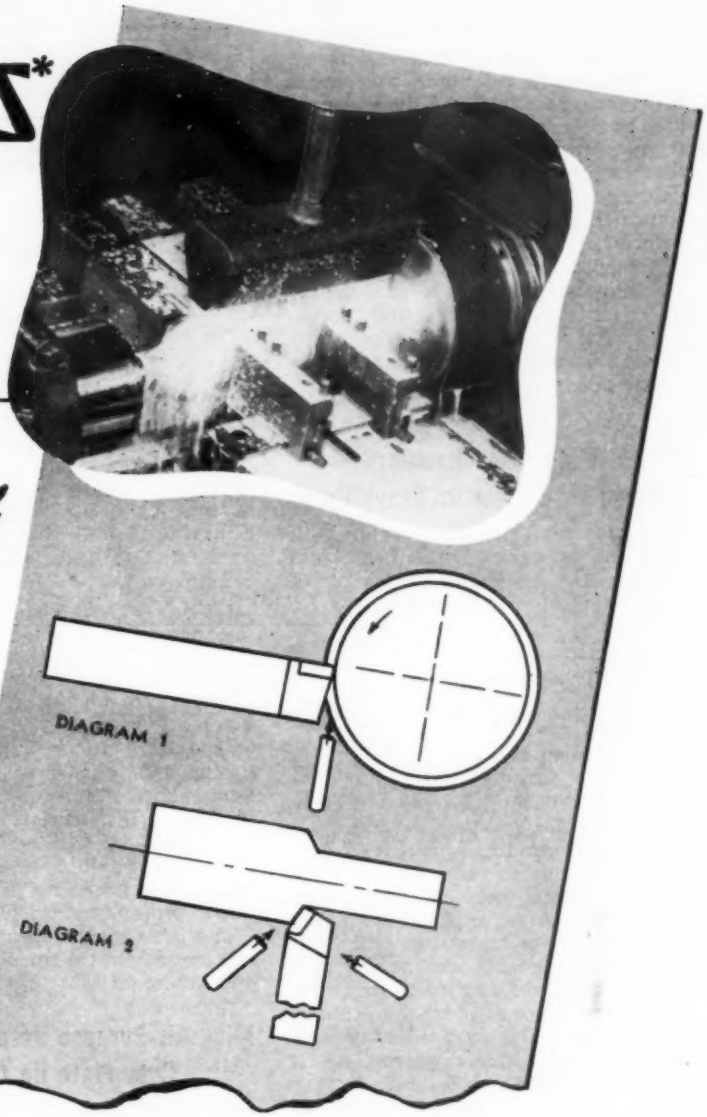
With two speed-control potentiometers and reversing contactors, different forward and reverse speeds may be preset so that only the operation of the forward or reverse pushbuttons is necessary to obtain a predetermined speed in either direction. Speed adjustment may be made at any time while the motor is running.

The control is arranged so that the



KENNAMETAL'S* *Rule 5*

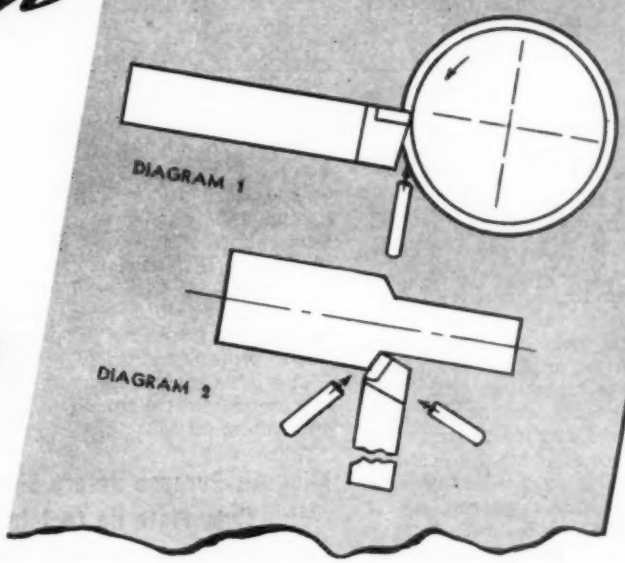
For Longer Tool Life



Apply Coolant Properly

TO REDUCE TOOL WEAR

STYLE 11



Through proper application of the coolant it is possible to reduce the rate of tool wear, and at the same time minimize power consumption and cutting pressure during a steel-cutting operation. If coolant is used, the operator should insure complete immersion of the KENNAMETAL tool tip while cutting.

When an extra wide chip is produced, the chip sometimes forms a "shed". This shed prevents cutting fluid, directed from the top, from immersing the cutting tip.

When this occurs the coolant can be directed from beneath the tool as shown in Diagram 1. When it is not practical to direct the cutting fluid from below, it may be found desirable to converge streams from the sides of the tool as indicated in Diagram 2.

Complete immersion of the cutting tip extends tool life by preventing the "quenching" action when interrupted flow of coolant again contacts the hot cutting edge.

For complete information on the care and use of KENNAMETAL steel-cutting carbide tools, write for your copy of the new KENNAMETAL tool manual.

*INVENTED AND MANUFACTURED IN U. S. A.

KENNAMETAL THE All American CARBIDE

McKENNA METALS Co.

103 Lloyd Ave., Latrobe, Pa.

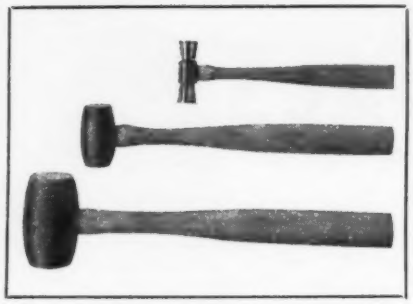
Foreign Sales: U. S. STEEL EXPORT CO., 30 Church St., New York (Exclusive of Canada and Great Britain)

Trade Mark Reg. U. S. Pat. Off.

motor starts at full field regardless of the setting of the speed potentiometer. If the speed is set above base speed, with weakened field, the speed control does not become effective and the field is not weakened until the motor reaches base speed. A special current-limiting device built as part of the standard unit provides fast, smooth automatic acceleration. The motor can be stopped quickly with a dynamic braking resistor that is not in the motor circuit during running conditions. The drive is available for ratings up to 1 hp. for single-phase operation on 110 or 220 volts.

Holland Metal Shop Hammers Come With Light or Heavy Heads

A line of metal hammers for machine shop and assembly line is being produced by the Holland Brass Works, 429 South Clinton St., Chicago, Ill. They are made of bronze cast head with a hickory handle. Sizes available are 5 oz. with 8 in. handle; 1 lb. head with 12 in. handle; 1½ to 3 lb. heads with 14 in. handle; 4, 5, 8 lb. heads with 18 in. handle. The sledge type has a 10 lb. cast head with 36 in. handle. These sizes can also be furnished in babbitt or pure lead.



G. E. Fluorescent Ballast Accommodates Three Lamps

Development of a three-lamp 40 watt, high power factor ballast for fluorescent lighting has been announced by General Electric Co., Schenectady, N. Y. This ballast is more adaptable to installation in a fixture than two separate ballasts, and the use of one ballast instead of two reduces the amount of wiring required for connections. This ballast is designed to operate on lighting circuits of 110-125, 199-216, 220-250, and 240-280 volts.

Blount High Speed Grinder Has Two Adjustable Tables

Announcement has been made by J. G. Blount Co., Everett, Mass., of the Model H.S. 10-in. high speed grinder. It is suited for grinding tap flutes, for bevel edge grinding on clicker dies, gear tooth polishing and for cutting off high-speed steel tools. Two adjustable work tables are furnished with this machine. These tables can be quickly removed and guards can be adjusted, so that the lower half of the grinding wheel may be exposed for the grinding of flutes of hand and machine taps. The adjustable wheel guards are of the exhaust type.

This grinder is equipped with two removable high speed precision ball bearing, quill-type spindles. The quills are B-belt driven by an electric motor which is mounted on a hinged bracket within the pedestal. Ventilator doors at the front and rear of the base of the machine provide cross ventilation. Lubrication of the quills is provided through sightfeed oil containers for each spindle. A pushbutton manual-operated switch located directly in front of the grinder is provided for motor protection.

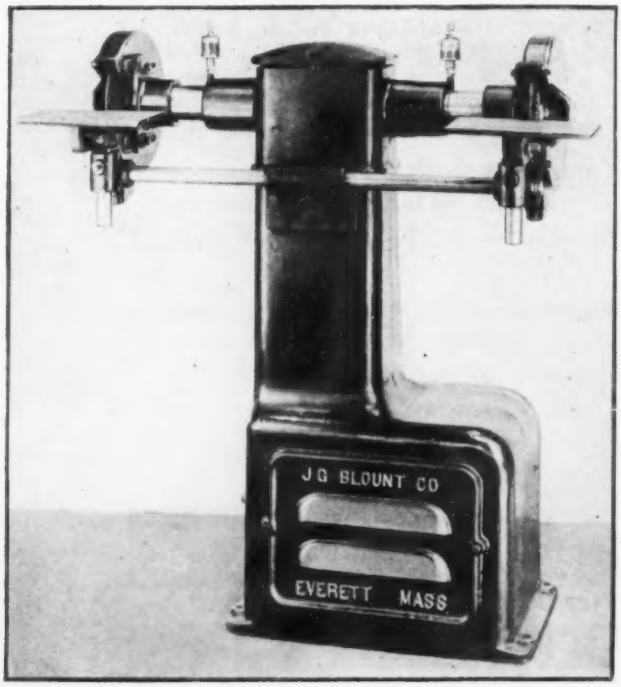
The table surface measures 10×8 in., maximum wheel diameter is 10×½ in., and minimum is ⅛ in. wide.

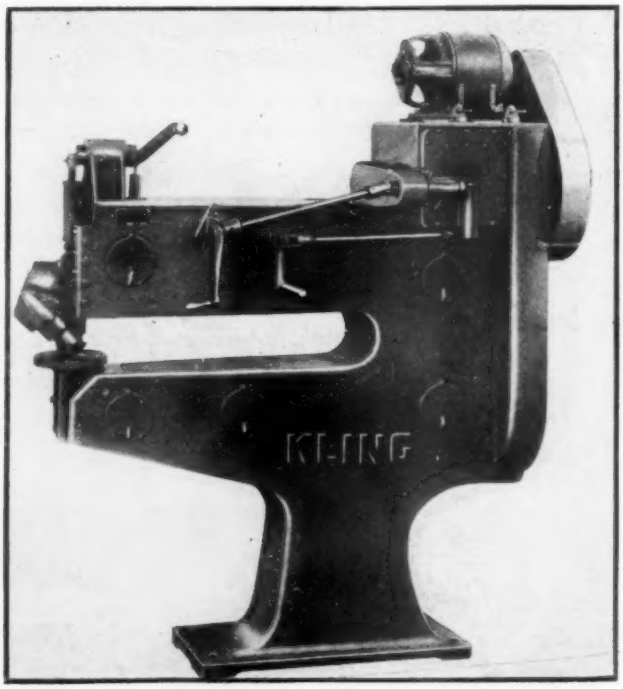
Kling All-Purpose Rotary Shear Cuts Plate Up to 1 In. Thick

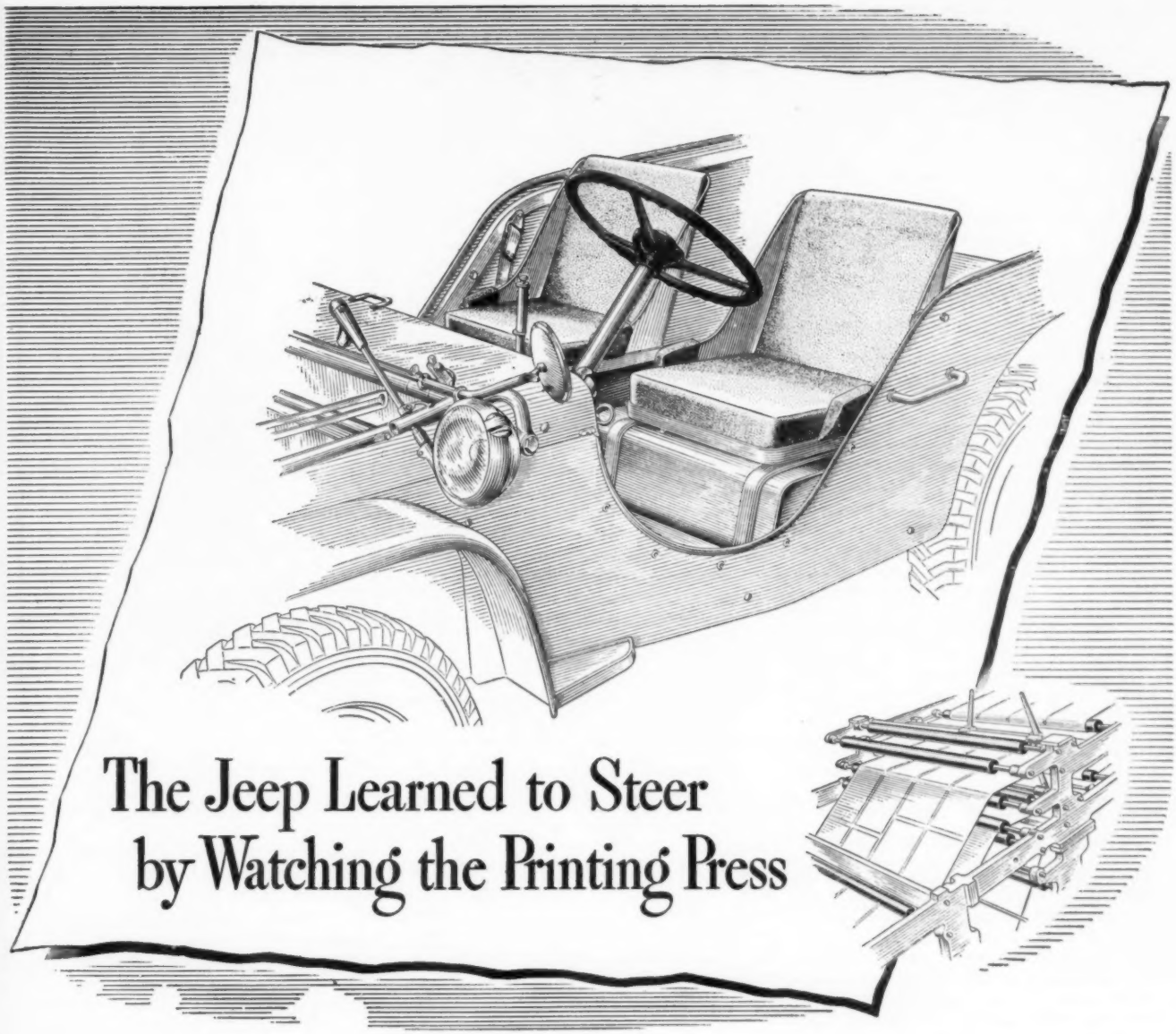
An all-purpose rotary shear has been announced by Kling Bros. Engineering Works, 1300 North Kostner Ave., Chicago, Ill. The machine cuts straight lines, openings, circles, odd shapes, strips, flanges, bevels, and offsets. It is possible to shear parts with small radii, right- or left-hand. The shear can also be equipped with rolls for beading, U-ing, wiring and forming operations.

This shear is designed to cut steel plate up to 1 in. thick, and proportionate thicknesses in other metals. All high-speed shafts are mounted on anti-friction bearings, while the slow-speed shafts are provided with large bronze bushings. The cutter shafts are equipped with thrust ball bearings. All gearing at the back of the machine runs in an oil bath. The balance of the equipment is Alemite lubricated.

The cutters are made of oil-hardening tool steel. A gib key provides for







The Jeep Learned to Steer by Watching the Printing Press

IT'S TOP-SPEED operation hour after hour in a printing press—no leeway for breakdowns that might delay the newspaper on its way to the waiting delivery trucks. So printing press makers picked the Torrington Needle Bearing for its ability to operate successfully in high-speed service, with little need of attention.

There's no question of high speeds in the steering column of a jeep, of course ... just an occasional turn through a fraction of a revolution. But that point of long life with little attention looked just as good to the jeep builders as it did to the press manufacturers. They, too, turned to the Needle Bearing, not only for its ability to stand up in severe service, but for its low friction coefficient that gives quick response to the steering wheel, its small size that contributes to compact design, its effective system of lubrication, its ready availability for all essential applications.

THERE'S A THOUGHT HERE FOR YOU TO CONSIDER when you start the design of your post-war products. Whether your problem is one of oscillation or of high-speed rotation, the Torrington Needle Bearing will give your customers the advantages of dependable operation, efficient lubrication, low starting and running friction. And of course, *you* will benefit by the Needle Bearing's low cost and ease of installation. You can get the preliminary information you will need by writing for Catalog No. 105, which lists sizes, rates, and typical applications—and Torrington engineers will assist you in working out specific service problems.

THE TORRINGTON COMPANY
Established 1866 • Torrington, Connecticut, U. S. A.
Makers of Needle and Ball Bearings
New York Boston Philadelphia Detroit
Cleveland Seattle Chicago San Francisco
Los Angeles Toronto London, England

TORRINGTON NEEDLE BEARINGS

KEYED TO TODAY'S NEEDS

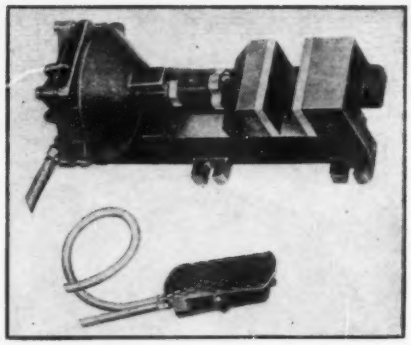
AND TOMORROW'S TRENDS

any take-up resulting from wear on the cutter heads. Setting of the cutters in the proper shearing relationship is provided by an adjustment on the lower cutter shaft. Friction clutches, of the Pullmore double-end oil type, permit shearing speed to be changed by simply shifting the clutch from one position to another. These shears are made in six size models with maximum shearing capacities ranging from ⅛ to 1 in. plate.

Brown Pneumatic Air Vise Operates by Foot Control

A foot-controlled pneumatic air vise has been developed by W. R. Brown Corp., 5720 Armitage Ave., Chicago, Ill. The foot control stays open or closed without constant foot pressure. This unit is suited for speeding up production on drilling, tapping, light milling, punching, bending straightening, staking, stamping and riveting.

The ram of this air vise is driven by a multiple-type diaphragm. The movable jaw has a maximum travel of ½ in. An adjustment screw enables the operator to set the jaw anywhere up to its maximum opening of 3 in. It comes with soft steel jaw faces easily fitted with cavities to hold castings, screw machine parts and the like. The unit can be attached to an air line up to 150 lb. per sq.in., or to a compressor.



Little Blacksmith Machine Notches Angles in Sheet

The Little Blacksmith No. 43 machine of arc-welded construction has been introduced by J. F. Kidder Manufacturing Co. Inc., 368 Colchester Ave., Burlington, Vt., for cutting up to a 5×5 in. 90-deg. notch out of the corner or side of a sheet with one cut. Any angle greater than this can be notched to this same size in two cuts. It will notch a rectangular piece out of the side of a sheet to a maximum depth of 4 in., minimum length of 5 in., and maximum length of 10 in. with two cuts. Any length can be notched with several cuts.

Capacity of this machine is 14 gage mild steel, 10 gage aluminum. It occupies a bench space of 15×13 in., and is equipped with gages. Weight is 200 lb.

Fray Tool & Reamer Announces Eleven Styles of End Mills

Eleven styles of end mills have been announced by Fray Tool & Reamer Co., 515 West Windsor, Glendale, Calif. They are made of high-speed tool steel individually heat-treated for the size and type of cutter and work on which they will be used. These Kurl Kut end mills include single-end, size ⅛ to 2 in.; long single-end, sizes ¼ to 2 in.; extra long, sizes ½ to 1¼ in.; 2-flute, sizes ⅛ to 2 in.; long 2-fluted single-end, sizes ¼ to 1¼ in.; ball end mills, sizes ⅛ to 1½ in.; extra long ball end mills, sizes ½ to 1¼ in., regular or 4-fluted B.&S. taper shank end mills, sizes ½ to ⅞ in.; B.&S. taper shank 2-fluted, sizes ½ to 1 in.

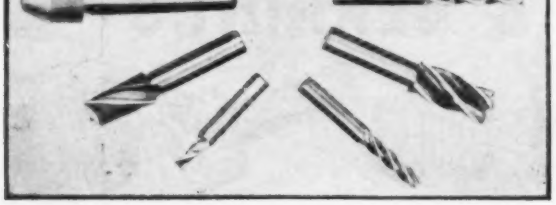
Other sizes include fluted chucking reamers with straight shanks, ⅛ to 1½ in.; rose chucking reamers with straight shanks, sizes ⅛ to 1½ in.; collets up to and including ½×1/16 in., all straight shanks in B.&S. or No. 2 or No. 3 Morse taper; solid counterbores, sizes 3/16 to 1 in.; and end mill holders for single-end or double-end, end mills with ⅜, ½ or ⅝ in. shank diameters.

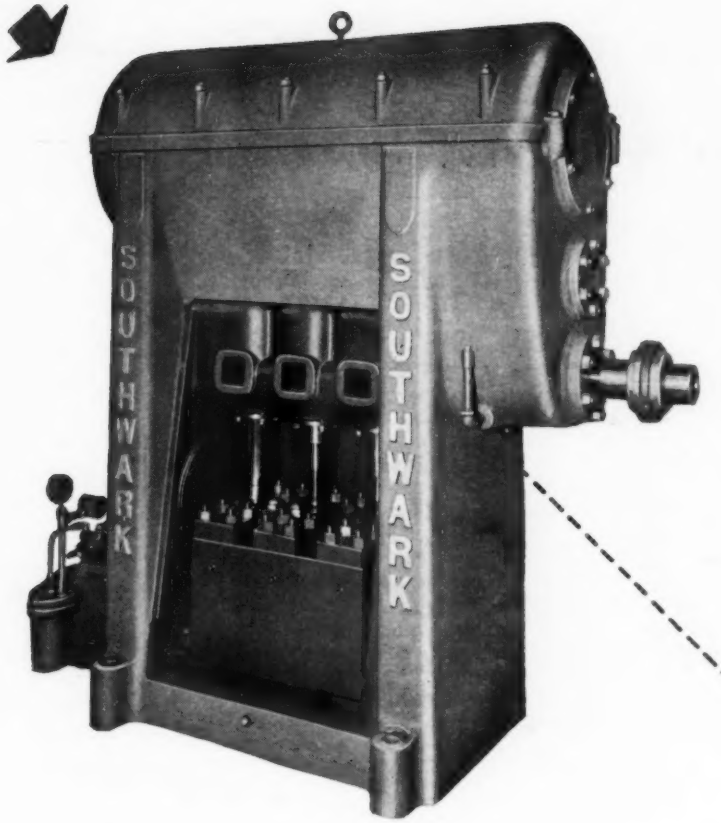
Williams Milling-Machine Vise Holds Work Close to the Table

For holding machine parts on a work table, Williams Machine Co., Inc., Poultney, Vt., has made available a milling machine vise designed to bring the bottom of the gripping jaws 1⅝ in. from the work table. This low grip holds the work closer to the table, and promotes better finishes with less vibration.

This vise is precision made with ground and scraped surfaces. Because this vise holds the work low, 2½ in. or more vertical range is made available on the machine.

The sliding jaw plate is held in the center ring from lifting to maintain parallel clamping of the vise jaws. The action of the clamping pressure is such that both the fixed jaw and sliding jaws are forced into pressure contact with the outer rim of the base. This pressure also further clamps the swivel adjustment, adding to the swivel lock that is provided to insure location of the swivel position. The vise jaws are 2 in. high. Other sizes available are 7 in. wide jaws with 5 in. opening, and 6 in. wide jaws with 4 in. opening.





High Pressure Pumps

Southwark's line of High Pressure Triplex Pumps have been thoroughly tested in actual service. Sound design and substantial construction have earned for these pumps a reputation for long life, low maintenance and high overall efficiency.

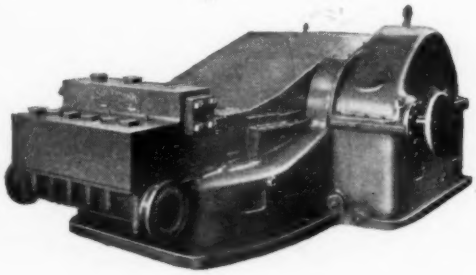
For delivering large volumes of water in conjunction with hydraulic press installations, horizontal pumps are built in 12-, 15-, and 18-in. stroke lengths. A 3-plunger arrangement provides a 60 degree overlap in discharge impulses and tends to smooth out pump pulsations.

The 12-in. stroke pump discharge ranges from 23 gpm at 7,500 lb per sq in. to 170 gpm at 1,000 lb per sq in.; that of the 18-in. stroke unit from 88 gpm at 7,500 lb per sq in. to 685 gpm at 1,000 lb per sq in. Other capacities and corresponding pressures are available.

Where a smaller capacity pump is required, the vertical pump—illustrated—is offered. Their capacities range from 2 to 100 gpm at pressures from 15,000 to 1,000 lb per sq in. respectively.

Write for Bulletin P-106 which contains a complete description of these pumps with tables showing dimensions, capacities and power requirements.

Baldwin Southwark Division, The Baldwin Locomotive Works, Philadelphia; Pacific Coast Representative, The Pelton Water Wheel Co., San Francisco.

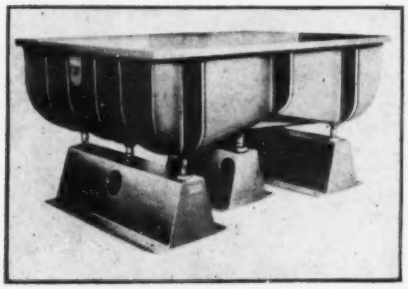


BLW THE BALDWIN GROUP **BALDWIN SOUTHWARK**

Division **THE BALDWIN LOCOMOTIVE WORKS,** *Philadelphia, Pa.*

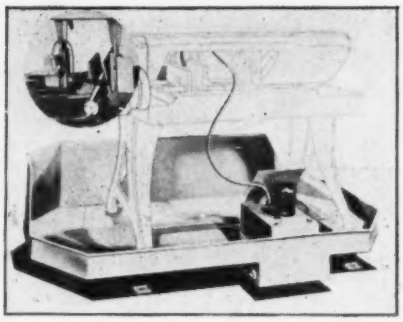
Machine Products Surface Plate Built for Heavy Work Loads

To meet extremely heavy load requirements, Machine Products Corp., Detroit, Mich., has developed an unusually large surface plate. It is mounted on especially designed pedestal type



bases. For leveling purposes, it is provided with three adjustable bearings supplemented by additional adjusting screws. Thus supported on several points of contact the plate cannot be dislodged by floor vibration or other causes, and will remain uniformly level.

This surface plate is made of Meehanite iron, heat-treated and is scraped to meet precision requirements. The surface measures 4×6 ft., and has a depth of 20 in. The total weight exceeds 2 tons.



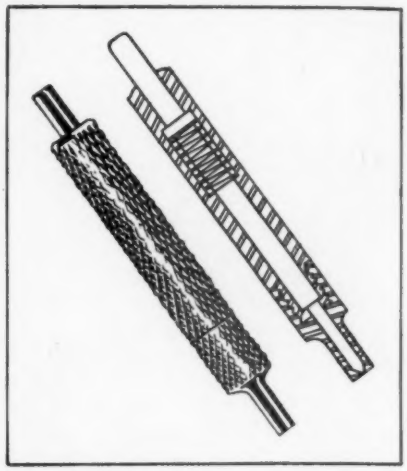
Gray-Mills Coolant System Used on Horizontal Bandsaws

The Model MS-20 coolant system offered by Gray-Mills Co., 213 West Ontario St., Chicago, Ill., is designed for use on all types of horizontal metal-cutting bandsaws. It has a pump mounted in a coolant return pan which is attached below the saw. Being larger than the saw itself, the pan catches all fluid and returns it to the pump for recirculation. Anti-splash shields are provided to guard the pump and operator from oil.

This system can be easily attached or removed, and no drilling or alteration of the saw is necessary. Another feature is the oil feed tube which is slotted to fit the saw blade, assuring full distribution of the oil over the blade.

Caffin Sleeved Tru-Punch Has Interchangeable Tips

An aircraft worker's transfer punch, called the Caffin Tru-Punch has been announced by Tru-Punch, Scotch Plains, N. J. It consists of a sliding punch within a sleeve, with the sleeve end machined to templet hole diameter.



Standard interchangeable tips available for Nos. 30, $\frac{5}{32}$, $\frac{3}{16}$, $\frac{1}{4}$ and $\frac{5}{16}$ templet holes. It is said that this tool is accurate to 0.001 in. and does not wear the holes.

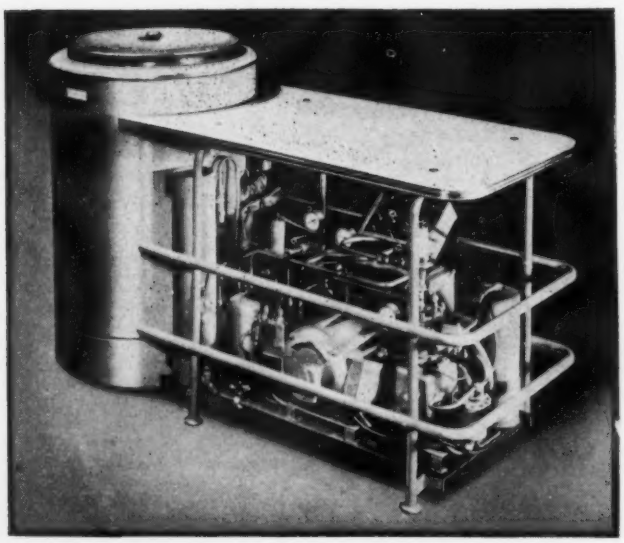
Deepfreeze Chilling Unit · Provides Sub-Zero Testing

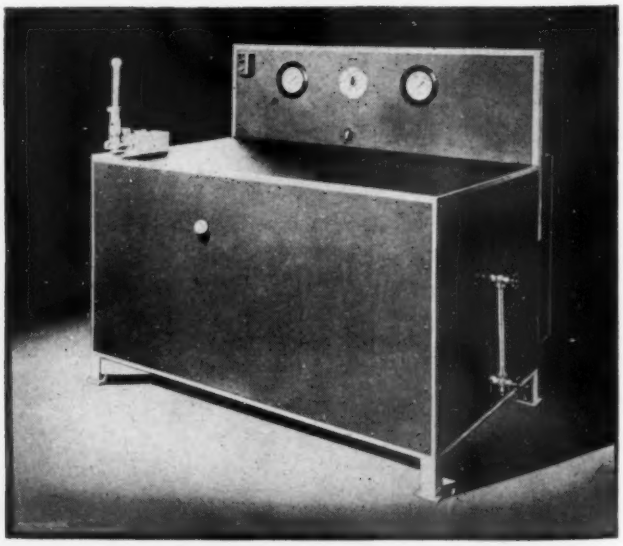
A wide range of sub-zero temperatures is provided in the Model D-70 Deepfreeze 2-stage industrial chilling unit announced by Motor Products Corp., Deepfreeze Div., 2301 Davis St., North Chicago, Ill. This unit provides sub-zero cold for the testing of aircraft instruments and parts, and for testing of plastic as well as many other materials. It has a range of —70 F. max.

The Deepfreeze unit consists of a double-wall cold cylinder which surrounds the walls of the chilling compartment. The interior diameter of the cylinder is 18 in. and depth is 30 in. It has over 24 sq.ft. of primary freezing surface, and a capacity of 33 gal. Other features include two compressors with refrigerated heads, a temperature control which is adjustable from atmospheric temperatures to —70 F., and a specially designed expansion valve electrically controlled. The over-all size of the chilling unit is 67×36×37 in. It is equipped with a ¾-hp. motor which operates on 110-220 volt current.

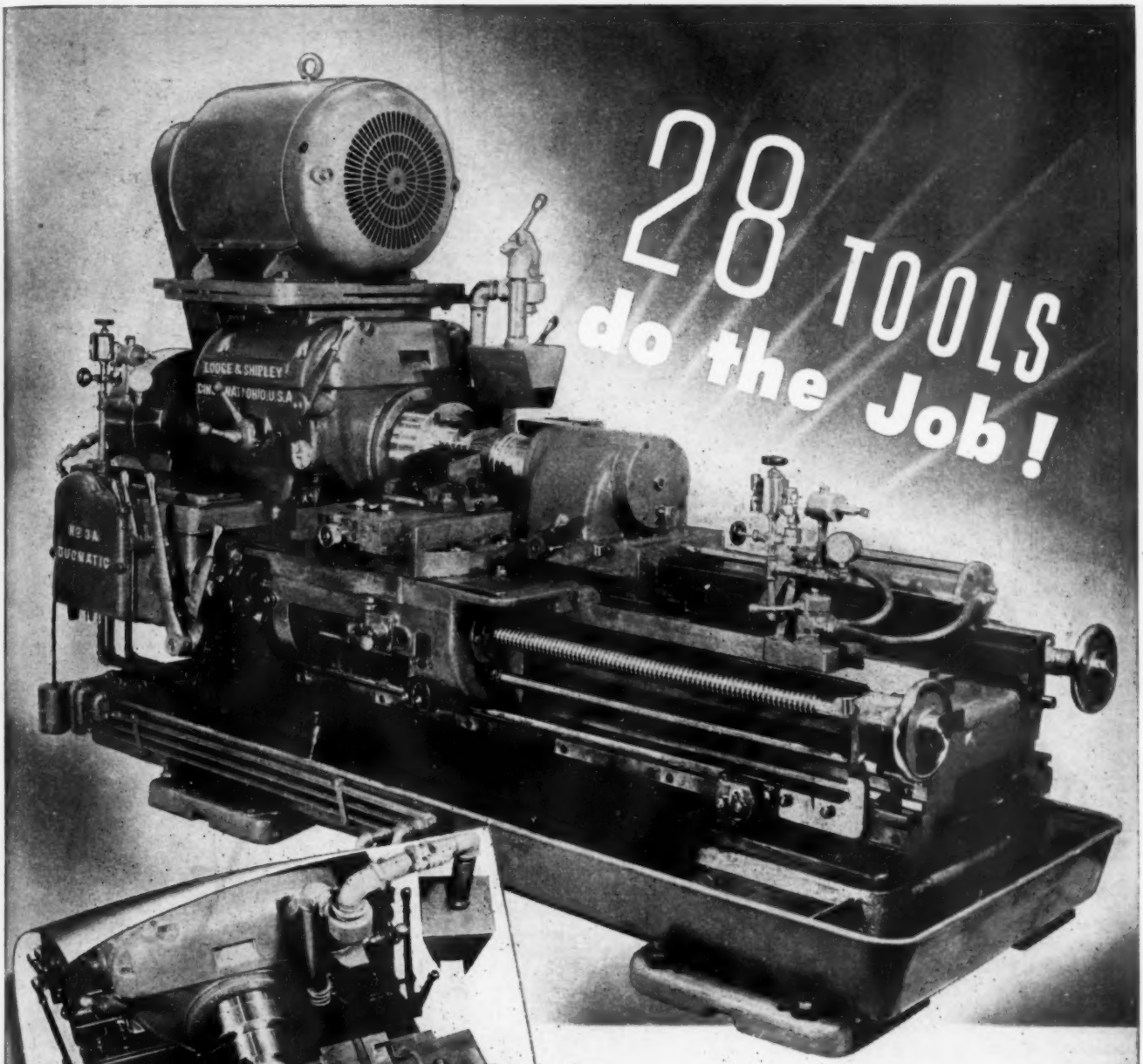
Voigt Hydraulic Test Bench Takes Several Units at a Time

For testing hydraulically operated devices, R. Voigt & Son Co., 1060 Military Road, Buffalo, N. Y., has made available an hydraulic test bench which has a working surface of perforated steel 3×5 ft. Because of the large-capacity circulating system (over 30 gal. per min. under pressure) permits up to 20 units to be tested simultaneously. Where greater production facilities are needed or larger parts are to be tested, the working surface





28 TOOLS do the Job!



Machining tapered fins on aeroplane engine cylinder barrels with two banks of tools . . . on a No. 3A Duomatic Lathe. • • • •

Proudly worn since March 6, 1942

Write for complete illustrated Bulletin No. 601

THE LODGE & SHIPLEY MACHINE TOOL CO.
CINCINNATI, OHIO, U.S.A.

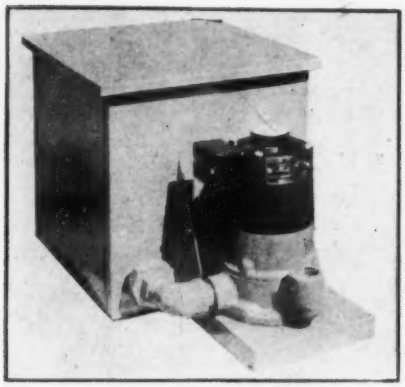
ENGINE TOOL ROOM AUTOMATIC LATHES

is enlarged to meet the need, or two benches can be used.

Built-in features include a sealed oil tank, oil filter, oversized piping, valves and fittings. Measurements of this test bench are 5 ft. 6 in. long, 4 ft. wide, and 4 ft. 9 in. high. It weighs about 1,500 lb.

Brady-Penrod Coolant Pump Now Has Single-Phase Motor

The Model 600 coolant pump brought out by Brady-Penrod, Muncie, Ind., is available with a 110-volt single-phase motor and is adaptable to any type of coolant in general use, and on

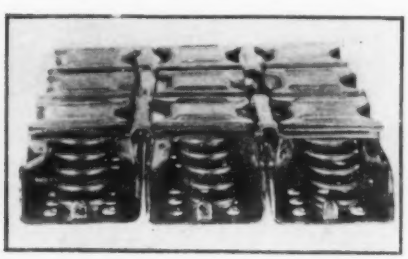


any type of machine for single or multiple installations. The motor is ⅛ hp. and will handle up to ten spindles or cutting tools, the flow of coolant being regulated to a flow of 1,200 gal. per hr.

If desired a 12×12 in. tank of heavy galvanized sheet iron can be furnished with the coolant pump. The tank has a built-in baffle separator to collect the heavy chips of metal carried by the returning coolant. It is equipped with a removable lid for cleaning without disconnecting the return piping.

Rande Nine-Cell Unit-Spring Absorbs Noise and Vibration

The unit-spring, adaptable for many uses where vibration, noise or shock requires absorbing, or as spring cushions in machine construction, has been introduced by Rande Specialty Co., P.O. Box 708, Hoboken, N. J. The device has a mounting with universal action, taking thrust from any direction. All parts are constructed of brass with alloy steel springs. The standard unit is of nine cell construction, 100

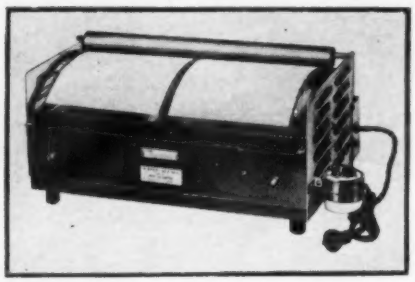


lb. load capacity, and occupies a space of 2½×2×⅝ in. Each cell deflects independently, but the cells are fabricated into a unit. Any cell can be removed and the base drilled to take an anchorage bolt, tightened to the point of starting-deflection. These units can be applied ot a wide variety of uses, either singly or in multiple blocks.

Each spring seats at 14 lb. load. Any weight can be floated by placing the proper number of 100 lb. unit-springs together on a solid footing under the machine base or other load. Static elimination can be provided by a plate of any ordinary insulating material without reducing the resiliency of the spring. A group of 36 unit-springs will occupy approximately 1 sq.ft. and will float 3,600 lb.

Spee-Dee Portable Printer Makes Black and White Prints

A portable table model Spee-Dee printer, for making blueprints or black and white prints in a few seconds, has been developed by Peck and Harvey, 4325 Addison St., Chicago, Ill., which



can be plugged into any standard electric outlet. Two sizes are available, one for prints up to 12×18 in., and another for 18×24 in. prints. To prevent the crowding of prints and overlapping or blurred edges, the printing surface on both sizes of this machine has been made oversize.

Kleer-Flo Cir-ku-Lator Pump Suits Wet Cutting Machines

Kleer-Flo Kool-Ant Cir-ku-Lator pump has been developed by Practical Products Co., 1629 University Ave., St. Paul, Minn., for use on milling machines, screw machines, drill presses, finishing machines, cut-off saws, tappers, grinders and lathes. It can be adapted to any standard or special machines which require wet cutting. This unit is designed for installation in places where it will not interfere with the operator or efficient operation of the machine.

This centrifugal pump with its open impeller action will eliminate chips, grits and other foreign substances. A feature of this unit is filtration, and a regulator valve controls the flow. It handles either emulsified or cutting oils.

Maximum capacity of the cabinet is 8 gal., with pump capacity at 75 gal. per hr., emulsified oils. The motor operates on 110 or 220 volts, 60 cycle a.c.

Lightguard Emergency Unit Operates by Magnetic Switch

The Exide Lightguard emergency lighting unit made by Electric Storage Battery Co., 19 St. and Allegheny Ave., Philadelphia, Pa., has been designed for emergency lighting at control equipment, and where workers are employed at night on machines, especially in crowded spaces. The unit is furnished with a plug for connection into a 110-volt a.c. supply. It can be easily installed on walls or posts. A magnetic switch automatically connects the lamp circuit to the battery when the normal current supply is interrupted and instantly lights the protected area.

A selenium trickle charger automatically recharges the battery upon restoration of the normal current sup-

ply to the unit. A switch is provided for manually controlling the lamp filament circuit in the event that illumination is not required. This Lightguard is equipped with an automobile driving light with 30-watt driving lamp. It throws a beam of light 50 ft. wide, a distance of 150 to 200 ft.,

All set to keep going-

Even the best of Tomahawks require sharpening once in a while. When you've got a job requiring a rotary form tool and you want to keep that job going with the minimum of down time, it is not a bad idea to use, when possible, multiple-gashed carbide tipped forming tools like the **"TOMAHAWK"** tool above.

When one carbide cutting edge is dulled, a sharp cutting edge is restored by simply rotating the tool slightly. This type of construction is particularly effective in tools which are relieved (backed-off) to provide cutting clearance.*

With multiple tipped single point carbide tools like this you can frequently eliminate as much as 90 per cent of your machine down-time for tool changes; you can cut the number of tools you have to carry in stock to keep the job running; you can save grinding time; and you can increase production per machine-hour.

*Genesee Tool Company is one of the few tool manufacturers in the United States with a completely equipped back-off grinding department.

Write for "streamlined" condensed catalog of Genesee tools. Ask for catalog No. GT-42 M.

GENESEE TOOL COMPANY

FENTON, MICHIGAN

* Registered Trade Mark

Make sure he gets it by using the *finest* standards available . . .

Today, manufacturers are working to closer tolerances on production lines, to meet the exacting specifications of our Army and Navy. It is, therefore, important that they have the *best* checking gages and instruments to meet these tolerances. This is the reason why the Dearborn Gage Company's Chromium Plated Gage Blocks are preferred by manufacturers who recognize their superior accuracies and longer wearing qualities. Yes, Dearborn gages cost more, because they are worth more to the manufacturer.

For complete information about these chromium plated gage blocks write or wire us today.

DEARBORN GAGE CO. 22035 BEECH STREET DETROIT, MICHIGAN

Originators of Chromium Plated Gage Blocks

★

Remember to Buy

THAT WAR BOND TODAY!

covering an area of 7,500 sq.ft. Overall dimensions of the Lightguard are 16½×6¼×18 in., weight 47 lb. The battery is a 3-cell Exide with thick plates assembled in a glass jar.

Durma-Gard Protective Garments Made of Plasticized Material

Durma-Gard protective garments for both men and women have been made available by West Disinfecting Co., 42-16 West St., Long Island City, N. Y. The garments are made of plasticized material, and are provided in protective sleeves, aprons, overalls, and coveralls. They are flame-resistant, impervious to most acids, as well as resistant to dust, powders and other irritants. The sleeves are adjustable to fit the wrist snugly, and the top is shirred with lastex for proper ventilation. Durma-Gard clothing may be washed in soap and water.

Murex Type A Electrode Does All-Position Welding

Murex Type A, an all-position a.c. electrode for electric welding has been developed by Metal & Thermit Corp., 120 Broadway, New York, N. Y. With this electrode, overhead and vertical welds can be made without the use of a highly specialized welding technique. Typical physical properties of the weld metal include yield points of 52,000 to 61,000 lb. per sq.in., ultimate strength of 62,000 to 71,000 lb. per sq.in. This electrode is available in 3/32, 1/8, 5/32 and 3/16 in. sizes.

NEW MATERIALS

Konag Castor Cleaner Made to Dissolve Grease

For such use as degreasing machinery, metal surfaces, parts, painted surfaces and concrete floors, National Graphite Co., 17 John St., New York, N. Y., has introduced Konag castor cleaner which is non-inflammable and mixes with water. It destroys grease accumulations by dissolving it with solvent action. It is said that this cleaner will not injure the skin as all ingredients have been neutralized. Konag castor cleaner can be applied with a brush or spray gun and by immersion.

Magnus Makes Available Vapor, Solvent Degreasers

The Magnus Chemical Co., Garwood, N. J., offers a line of vapor and solvent degreasers, using the solvent known as Phillsolv. These degreasers are air-cooled, allowing the machine to be portable. The Phillsolv permits boiling at higher temperature, and has higher density of both liquid and vapor.

Carhoff No-Fog Goggle Cream Applied to Prevent Fogging

No-Fog has been developed by the Carhoff Co., 3050 Kensington Rd., Cleveland, Ohio, to prevent fogging when applied to eye glasses, goggles, for polishing photographic lens, and many other uses. It is a cream, said to be harmless to the skin, glass or fabric, and non-abrasive. It is applied by rubbing on both sides of lens or glass, then polishing with a soft paper or cloth. No-Fog is available in 1 oz. and 1 lb. jars.

TRADE PUBLICATIONS

ASBESTOS "The Asbestos Factbook," a compact assembly of facts concerning asbestos, contains 16 pages covering the origin, facts, locations, uses, analyses and qualities of asbestos. This book is available from "Asbestos," Inquirer Bldg., Philadelphia, Pa., at 10 cents a copy.

CONTROLLERS The Bristol Co., Waterbury, Conn., offers a loose leaf binder of bulletins covering automatic control and recording instruments for industrial furnaces, dryers, kilns and ovens. Bulletins are well illustrated with photographs, application drawings and wiring diagrams, and the material included gives a wide selection of types and combinations.

ELECTRONICS A bulletin called "Electronic Index of Industrial Equipment," which illustrates and describes new types of electron motor control, lifting magnet rectifiers, inverters, cycle-changers, vibrating screen power supplies, and induction heating apparatus for the small shop, is offered by Electron Equipment Corp., Palm Springs, Calif.

GRINDERS An 8-page bulletin, No. 201, showing their complete line of carbide grinders and giving full information on carbide tool maintenance is offered by Hammond Machinery Builders, Inc., 1618 Douglas Ave., Kalamazoo, Mich.

INSULATORS The B. F. Goodrich Co., Akron, Ohio, has revised catalog section 7900, 4-41 on Vibro-Insulators and published an engineering work sheet on the subject.

MACHINE TOOLS The 24-page catalog issued by J. L. Lucas & Son, Inc., Bridgeport, Conn., contains photographs and descriptions of the rebuilding of machine tools in their plant. Mention is also made of the new machine tool division.

METAL DUPLICATING A completely revised 32-page catalog, No. 43-4, on the Di-Acro system of metal duplicating without dies, has been prepared by

(advertisement)

Steel-Service Plants Help Speed Acceptance of NE Steel Program

Today's widespread use of the new NE (National Emergency) Steels has undoubtedly resulted from the efforts of steel warehouse distributors. Nation-wide availability plus an intensive educational campaign has popularized NE's and permitted vast savings in critical alloying elements, which otherwise would have been lost to the war effort.

Outstanding leader in this NE program has been Joseph T. Ryerson & Son, Inc., nation's largest warehouse distributor. From the outset they have been working in every way to encourage industry to switch to these new lean alloy steels. Hundreds of tests have been conducted in the Ryerson Laboratory. Heat treatment facts and figures have been furnished to customers with each shipment of NE Steel. Ryerson has published a helpful booklet on NE steels, which is available to anyone interested.

Personal contacts with Ryerson engineers and metallurgists can further facilitate your conversion to NE's if you have not already done so. Warehouses, of course, continue their vital service of steel from stock. (See ad below.)

For Quick Action on Steel

Whether it's fast service, a steady, reliable source, a cutting or fabricating operation that will facilitate your production, or just information and assistance, you're most apt to get what you want by calling Ryerson first!

Ryerson maintains leadership in the steel business by making good every promise, by knowing the kind of service customers want and giving it to them, and above all else, by having in *stock* thousands of kinds, shapes and sizes of steel for immediate shipment.

Stocks are reasonably complete, considering wartime demands; so whatever kind of steel you want, within the WPB plan, *call Ryerson first!*

JOSEPH T. RYERSON & SON, *Inc.*, Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City

RYERSON STEEL-SERVICE

WILL YOU BE A WAR CASUALTY?

Many American manufacturers are making tremendous profits today . . . profits far out of proportion to anything they enjoyed during peacetimes.

It is a question whether many know why they are making so much money.

Some are "patting themselves on the back" for their efficient management. Many who could not much more than break even on their prewar operations find that their present three-shift operation . . . most likely because of a one-shift break-even point . . . yields a very high profit.

But during wartime, profits are not necessarily a measure of efficiency. All of the inefficiencies which were responsible for low profits during peacetimes may be waiting to crack down like Mar's broadsword when the war is over.

Take full account, therefore, of your operations NOW... know your profit-volume relationships... subject all of your controls to a fine-tooth comb inspection . . . get your house in order for whatever may come.

★ ★ ★

Just as my organization has helped our clients with their war conversion problems, so will we help smooth the way for peacetime operations.

Geo. D. Trundle Jr.
President

THE TRUNDLE ENGINEERING COMPANY

Consulting Management Engineering

GENERAL OFFICES · CLEVELAND · BULKLEY BLDG.
CHICAGO · City National Bank Bldg. · 208 S. La Salle Street
NEW YORK · Graybar Building · 420 Lexington Avenue

O'Neil-Irwin Mfg. Co., Minneapolis, Minn. Several improved Di-Acro units and an entirely new model are included.

METAL STAMPING A small lot metal stamping service without prohibitive die costs is outlined and illustrated in a booklet issued by Dayton Rogers Mfg. Co., 2835 Twelfth Ave. South, Minneapolis, Minn.

MILLING MACHINE The Lincoln Machine Specialty Co., 549 W. Washington, Chicago, Ill., has prepared a 4-page bulletin which illustrates and describes high speed milling machine base, high speed milling head attachment for milling, drilling, or boring, and extra parts and accessories.

PROGRESS Winfield H. Smith, Inc., Springville, N. Y., sums up 42 years of progress in their 24-page booklet entitled "There is More Than Meets the Eye in Speed Reducers," which explains what and who the company is.

RUBBER PARTS To aid industrial engineers, designers, plant superintendents and purchasing agents, The B. F. Goodrich Co., Akron, Ohio, has published an 8-page catalog section, No. 7020, designed to supply practical information in the use, application and development of rubber parts molded to fit specific industrial requirements.

SAFETY Catalog No. 50 of The Boyer-Campbell Co., 6540 Antoine St., Detroit, Mich., contains 134 pages describing safety equipment. Principal subjects covered are face and head protection, women's protective apparel, guards, safety tongs, clothing, gloves, vapor proof magnifying lights and various models of Super Sight available for industrial and first aid use.

SHEARS A two-color, 8-page booklet on wire rope shears has been released by The Watson-Stillman Co., Roselle, N. J. Divided in two sections for easy reference, the first section is devoted to the hand-operated shear for clean, fast cutting and the second section to hydraulically - operated shears for heavier work.

TACHOMETERS The Herman H. Sticht Co., Inc., 27 Park Place, New York, N. Y., has issued Bulletin No. 790 which describes the Model J single range hand tachometers designed for heavy duty service.

TRUCKS AND CASTERS A semi-loose leaf type catalog containing popular models of factory trucks and trailers and a 4-page insert devoted to heavy duty all steel caster specifications is offered by Rose Mfg. Co., 12400 Strathmore, Detroit, Mich.

WELDING A complete line of Flexarc A-C welders, with current ratings from 100 to 500 amp., is described and illustrated in 12-page booklet B-3136, offered by Westinghouse Electric & Mfg. Co., Dept. 7-N-20, East Pittsburgh, Pa.

SEEN and HEARD

By JOHN R. GODFREY

Marble Surface Plates

Here's a new angle on the substitution of materials I saw the other day—a surface plate of marble instead of cast iron. It is guaranteed to be flat within a half-thousandth and sold at a very low price. It's a clever idea by someone in the marble business to give them a new outlet for marble, for their machine equipment and work for their labor. The surface is said to be approximately the same hardness as cast iron, but it scratches a bit easier. Small scratches, however, are not important because they are below the surface and do not affect the use of the plate for its usual work. If a scratch should force the edges up above the surface that would be objectionable. But for most uses marble seems to offer possibilities.

Balance—And What It Costs

We all know the importance of balancing the parts of revolving machinery. This is particularly necessary in the case of airplane propellers which run approximately 1,750 r.p.m. and are out on the end of a shaft none too firmly supported. In fact when we study the way a large airplane engine weighing from 2,000 to 3,000 lb. is held by a few bolts on the end of a light steel tube structure, we wonder why they stay in place. If we add to this the stresses imposed by an unbalanced propeller, we are in for trouble.

Every blade of the propeller must balance with the others. With the three- and four-bladed "props" this means extreme care in the balancing of the blades. But this isn't all. In some plants at least they try to have every blade so carefully balanced that it will interchange with any other blade, in any set. In other words they make every blade as nearly like every other blade as possible. This costs real money in hand labor and inspection.

In building engines we select connecting rod and piston assemblies to match the others used on that particular engine. But we do not try to have them so nearly alike that they will go into any other engine. It would save a lot of time if we could handle propeller blades in the same way.

Wooden Propellers

Some years ago wood began to take a back seat in many ways. Desks and other office furniture went "steel," even bedsteads and bureaus forsook wood for metal. Now, owing to scarcity of steel scrap, partly because we sent so much to Japan, wood is staging a come-back. And, having had the opportunity, wood is doing things which

SPEED the FINISH

● Wherever you find a Chicago Mounted Wheel at work, you'll find 100% grinding speed and efficiency.

Mounted firmly on its own steel shank, each wheel is a whirling point of easily controlled power that cuts valuable man hours. Jobs are completed so speedily that bottlenecks due to slow finishing of vitally needed parts are removed. Work is so smooth that rejections are practically nil.

Available in 300 shapes and sizes — every grade and grain — a best wheel for every job.

TEST WHEEL FREE Tell us kind of job, type grinder you use and size wheel you'd like and we'll send one postpaid for you to try.

AMERICA'S HEADQUARTERS FOR MOUNTED WHEELS SMALL GRINDING WHEELS

★Half a century of specialization has established our reputation as the small wheel people of the abrasive industry.

PROMPT DELIVERY

With WPB approval and endorsement, we stopped making all wheels larger than 3" in diameter. By specializing* on Mounted Points and Grinding Wheels 3" and under in diameter, 24 hours a day, we have stepped up production and are keeping up with demand. Our central location is another big advantage—no time is lost between our production line and yours.

NEW CATALOG — Shows Chicago Mounted Wheels in actual colors, also portable electric tools and time-saving accessories.

CHICAGO WHEEL & MFG. CO.

1101 W. Monroe St. Dept. AT Chicago, Ill.

AT-5

☐ Send Mounted Wheel Catalog
☐ Free Wheel. Size.....
☐ Also interested in Grinding Wheels.

Name .....

Address .....

Save scrap to beat the Jap—to hurry Hitler to defeat. Save time and manpower with mechanized material handling. Put Standard Conveyors and Standard equipment to work . . . to convey . . . lower . . . lift . . . pile . . . or tier materials and merchandise in your plant.

If your products are considered necessary to the war effort, Standard Conveyors are available for your needs. Write for full information and a copy of Bulletin AM-4 "Conveyors by Standard"—a valuable handbook on conveying methods.

STANDARD CONVEYOR COMPANY
General Offices: NORTH ST. PAUL, MINN.
Sales and Service in All Principal Cities

STANDARD
Gravity and Power
CONVEYORS

★ ENGINEERED FOR FASTER PRODUCTION ★

were unheard of in the past. The advances made with plastics as a bonding agent for plywood have helped immensely and made possible the use of wood in places where it formerly would have failed.

The success of the Mosquito bombers in England, which are of plywood have given plywood another chance. Of course we had a plywood monococque-bodied plane in the first World War, the L-W-F. Here the plywood was wrapped around a cast iron form and held until the glue set; was then braced in the inside after removal from the form. But the best glue then was inferior to our present plastic bonds. Then too we have learned that we can compress wood to get density and strength. Wooden propellers are now made of plywood, bonded with plastic and formed to finish size and shape in a mold. The British are using wooden propellers on some of their fighters. We may go back to wood for some planes beside trainers.

Canada Creates Precision Instrument Industry

With necessity as the incentive, and starting from the ground up, Canada has created and completed an optical glass and instrument producing industry.

Beginning in August, 1940, with two employees, the Canadian government-owned enterprise has grown to 3,000 trained employees producing 8,000 finished polished components in one week.

After sudying British and American systems, an arrangement was concluded with a Birmingham (England) company which made available every detail of its exclusive operations.

To attain the knowledge necessary to produce the polished optical components, selected learners were sent to a United States company for a course of four to six months, and an optical designer was engaged from a Canadian university.

It was soon found that instrument making was not simply an extension of machine shop practice. There were no instrument makers as such available, so good toolmakers were called on to learn the nature of the work by hard experience. To do this they made a model of each type of instrument by hand, modified it until it conformed to specifications and from that stage prepared production drawings.

Most of the operations are done on standard and universal types of machine tools with fixtures, and the large majority of the threaded parts are more satisfactorily threaded by chasing than by cutting with tap or die. It has been found more economical to manufacture parts to a high degree of commercial accuracy and achieve the necessary sensitivity in the assembly by hand, rather than to attempt to manufacture parts individually to the highest degree of gage precision.

THE "SKILL" IS BUILT INTO THE MACHINES WITH VICKERS HYDROMOTIVE CONTROLS

SKILLED workers are scarce these days. Many machines must be operated by people who do not have the finished dexterity that comes with long training and experience. Machines must be built to demand less of the operator.

Vickers Hydromotive Controls make it possible to build "skill" into the machine. Any desired control sequence may be set up with a Vickers Hydromotive Circuit. Complex operations may be reduced to a simple routine—or may be made automatic. Controls may be interlocked so it is impossible to do the job wrong. Exact load limitations may be applied so the machine cannot be overloaded.

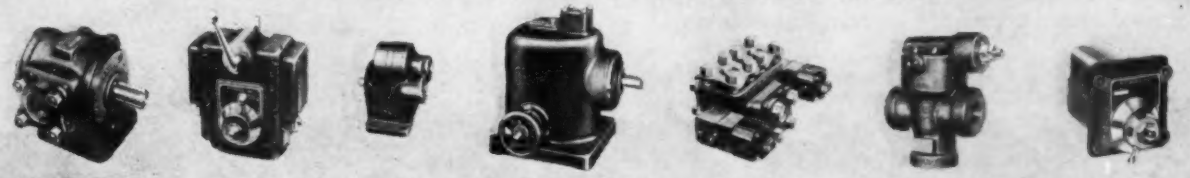
Such machines are safer—give more and better production, reduce work spoilage—demand much less skill in the operator.

Discuss "hydraulics" for *your* particular machine with a Vickers Application Engineer.

VICKERS *Incorporated* • 1410 OAKMAN BLVD. • DETROIT, MICHIGAN

Application Engineering Offices: CHICAGO • CLEVELAND • DETROIT • LOS ANGELES • NEWARK • ROCKFORD • TULSA • WORCESTER

Representative of More than 5,000 Standardized Vickers Units for Every Hydraulic Power and Control Function



CONSTANT DELIVERY PUMPS · CONTROL ASSEMBLIES · FLUID MOTORS · VARIABLE DELIVERY PUMPS · DIRECTIONAL CONTROLS · PRESSURE CONTROLS · VOLUME CONTROLS

Did y… get your copy?

If you're machining copper, brass, bronze or nickel silver, this 32-page Anaconda Publication will prove helpful in determining the most effective cutting speeds, feeds, tool rakes and clearances to be used on more than 40 copper alloys. Production engineers and machine operators are finding this new booklet helpful in getting the most out of their machining operations. Your engineering department will also find much useful data in the tables of compositions, physical constants and physical properties, convenient weight tables, conversion factors and references to Standard Specifications. Use the convenient coupon. 43162

THE AMERICAN BRASS COMPANY
Waterbury, Conn.

Please send copy of the manual, B-3, "Machining Copper and Copper Base Alloys."

Individual.....

Company.....

Address.....City.....

ANACONDA

Anaconda Copper & Brass

THE AMERICAN BRASS COMPANY, General Offices: Waterbury, Connecticut

Subsidiary of Anaconda Copper Mining Company • *In Canada:* ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*

McKAY ELECTRODES HELP LAUNCH 'EM AHEAD OF SCHEDULE!

The modern miracle of the "7-day cargo vessel" is an actuality made possible chiefly by welding. As dozens of these sleek all-welded hulls slip down the ways on coast lines all over America, remember that McKAY Shielded-Arc Electrodes have contributed greatly to this accomplishment.

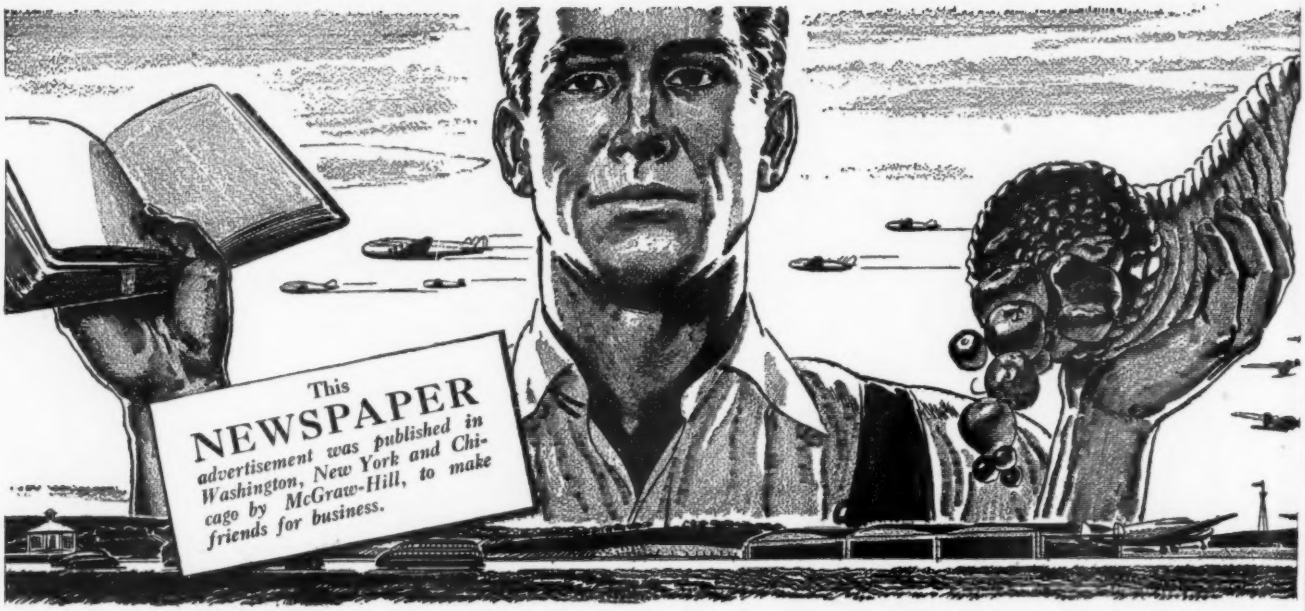
Virtually the entire output of McKay Electrodes is now required to satisfy the growing demands of war. Carload after carload moves out not only for marine construction but for a multitude of other vital uses where the advantages of the "researched Electrode line" have been demonstrated. The McKay Manufacturing Policy—"Every Electrode a leader in its class."

THE McKAY COMPANY · PITTSBURGH, PA.
PACIFIC COAST SALES OFFICES: 125 S. Santa Fe Ave., Los Angeles · 100 Howard St., San Francisco

The McKay line includes regular carbon steel, stainless, and alloy steel electrodes for every welding purpose. Literature on request.

Among the first honored with the Navy "E", The McKay Company is proud of the broader award of the Army-Navy "E".

McKAY WELDING ELECTRODES
AND INDUSTRIAL, MARINE AND AUTOMOTIVE CHAINS


This
NEWSPAPER
advertisement was published in Washington, New York and Chicago by McGraw-Hill, to make friends for business.

Do You Believe?

Do you believe that Industrial Progress is the basis of all good living?

That Industry is the source of better living is so clear to you and me that it would seem everybody would understand it.

But when we try it on your friends and neighbors! Or, review the course of history! Or look among our laws to see how many were designed to encourage industrial growth!

You'll find that few people know where good living comes from.

We are trying to explain the source of good living in McGraw-Hill magazines, and in newspapers. A current advertisement is shown here.

We ask other companies, all over the nation, to join us in running the "Seed Money" message. We supply free mats (1,470 line size, for newspaper use) with space for name of local sponsor.

James H. McGraw, Jr.

President

McGraw-Hill Publishing Company, Inc.

GOOD LIVING

Comes *Only* from Industrial Progress

THE more we believe in the Four Freedoms, the greater our obligation to understand them, and to know exactly what we have to do to enjoy *all* of the advantages they imply.

Take Freedom from Want, for instance. Where will it come from? Will it be the gift of a government department? Can it be created by issuing orders and directives?

► Of course not. Executives and government departments get their powers as well as their money from Congress. Can Congress create Freedom from Want by law?

Not in the final analysis. Congress can only allocate the total energies of our nation by law. It can take all the good living there is and divide it up differently.

So, if you happen to live poorly and want to live better, it's to your interest to see that Congress does a very wise job when the time to divvy up arrives.

Reprints of this advertisement are available in booklet form. (Less than 100 copies free. Larger quantities, $1.50 per 100; $10.00 per 1000.)

Good Living Comes Only from Industrial Progress (cont'd)

Congress can assume either that industry can't grow any more and try to solve the problem by dividing up existing jobs, or it can stimulate *more* good living, through wise laws that encourage Industrial progress and make more jobs.

► Multiplication will work a lot better than division, in this case.

If Congress will hold on to the fact that art, science, political experiments, luxuries AND necessities *all* must have their foundations in healthy industry, it will be more likely to pass only those laws which encourage industrial growth.

"Seed Money" an Example

When Congress, and the people, realize that business progress is the foundation of all improvement, our tax laws will stop confusing personal profit (salaries and dividends) with reinvested profit.

Profit held for reinvestment is the SEED MONEY of business. It is the money a business saves from current operations to insure future growth.

► Business will need billions of "Seed Money" dollars when the war is over. But, under the present tax law, industry cannot save as it should for that rainy day.

You hear lots of talk about the jobs that will result from the transparent automobiles and the sky-sedans that industry will build after the war, but not enough talk about the need for SEED MONEY to turn those hopes into realities.

The practical fact is that business cannot adjust itself to postwar production without "Seed Money."

► "Seed Money" will pay for the research that must come before new and better postwar products can be built. It will pay for re-tooling when new models are produced. It will pay for the study of methods to get the lower costs that will make it possible for more people to buy. It will pay for setting up new distributors and dealers, and for hundreds of other activities that are involved in the growth of business.

The tax law should be adjusted to allow business to accumulate funds for these necessary tasks of postwar development.

Ask your Congressman to see that American business is given a chance to create jobs after the war, by revising the excess profits tax so as to leave the "Seed Money" and by reviewing all laws with this principle in mind:

"Industrial Progress
is the Source of all Good Living."

THE McGRAW-HILL NETWORK OF INDUSTRIAL COMMUNICATION

22 publications, which gather "war-news" from the "war-production-front" through a staff of 153 editors and 725 engineer-correspondents . . . More than 1,500,000 executives, designers, production men and distributors use the editorial and advertising pages of these magazines to exchange ideas on war-production problems.

McGRAW-HILL BOOKS

Publishers of technical, engineering and business books for colleges, schools, and for business and industrial use.

McGRAW-HILL

PUBLISHING COMPANY, INC. . . . BOOK COMPANY, INC.

330 WEST 42ND STREET, NEW YORK

THE McGRAW-HILL NETWORK OF INDUSTRIAL COMMUNICATION:

American Machinist • Aviation • Bus Transportation • Business Week • Coal Age • Chemical & Metallurgical Engineering • Construction Methods • Electrical Contracting • Electrical Merchandising • Electrical West • Electrical World • Electronics • Engineering & Mining Journal • E. & M. J. Metal and Mineral Markets Engineering News-Record • Factory Management & Maintenance • Food Industries • Mill Supplies • Power • Product Engineering • Textile World • Wholesaler's Salesman • Business Publishers International Corporation, an affiliate, publishers of Business and Technical Magazines for Latin America, and Overseas Circulation.

Will Peace Come In Our Time?

Most certainly it will—and sooner than you may expect! With it will come the crucial test of whether or not American industry can convert as efficiently to peace as it has to war. From our extensive relations with hundreds of varied manufacturers we know of scores of amazing new products that only await the message of peace to come into being. Everyone looking ahead to that great day can even now count on the assistance of the Weatherhead plants which are producing scores of vital parts for planes, tanks, ships, trucks and munitions at the rate of *millions every day!*

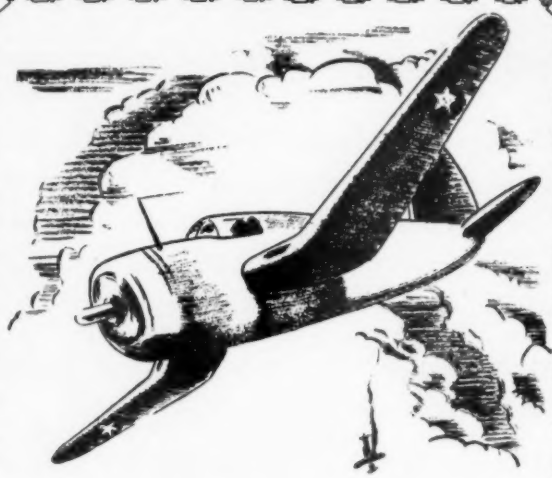
Look Ahead with

Weatherhead

THE WEATHERHEAD CO., CLEVELAND, OHIO

Manufacturers of vital parts for the automotive, aviation, refrigeration and other key industries.

Plants: Cleveland, Columbia City, Ind., Los Angeles
Canada—St. Thomas, Ontario



WHEN *Precision* COUNTS

It takes precision flying and precision firing for a pilot to down an enemy plane. Today's demands on marking equipment, likewise, are for speed, accuracy and winning performance. Countless thousands of vital parts for victory are being marked every day faster, better and at lower cost on precision built Noblewest marking machines. Why not let us solve your marking problems. Write today for our new catalog supplement No. 43—"Your Guide To Better Marking."

MODEL 163
Does marking that formerly required six men—and does it far better. "One of the best machines that has come into our plant!" exclaimed an aircraft official.

NOBLE & WESTBROOK MANUFACTURING CO.
Marking Specialists Since 1904
EAST HARTFORD, CONN.

MARK IT BEST WITH NOBLEWEST®

A flexible machine that is the last word in simplicity of operation

HI-SPEED
HONING and LAPPING MACHINE

for use with any standard make honing head

HONES CYLINDERS up to 24" in diameter . . . with STROKES from 20" to 72" . . .

IDEAL FOR PRODUCTION JOBS INVOLVING:

Aircraft parts . . . Ordnance parts . . . Diesel engines . . . Compressors . . . Pumps . . . Internal combustion engines . . . Steam cylinders, etc.

Speed up war work involving internal cylindrical surfaces by utilizing a HI-SPEED Honing Machine. When used with proper honing head of any standard make, the HI-SPEED machine produces accurate, straight, round, smooth bores—amazingly fast.

Unique positive stop and dwell system makes it possible to stop the spindle without shock or impact at the bottom of each stroke, at any point within the stroke range and hold the spindle without reciprocation, at that point up to 1½ minutes. Ideal for "blind hole" honing and straight line lapping or honing.

All controls are located at the front of the machine at the operator's station . . . No ladders to climb . . . Stroke setting, hone withdrawal, short stroking at any point, changes in speed of reciprocation or rotation of the spindle made instantly from operator's station.

The HI-SPEED Honing Machine is made in 4 sizes, any one of which can be had with strokes up to 72"... Designed for use with any standard make of honing head.

Tell us your requirements—and our engineers will promptly furnish you with complete information, prices and early delivery dates.

Illustrated is No. 0 Machine equipped for 36" stroke with 80" under the spindle.

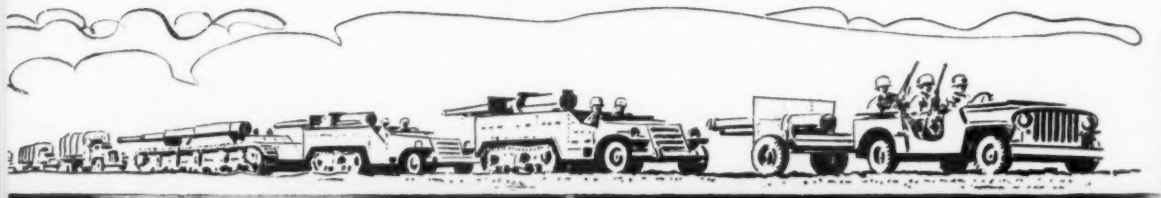
NOTE THESE SPECIFICATIONS:

Model No.	No. 0	No. 1	No. 2	No. 3
Stroke (standard)	20"	36"	48"	72"
Working Base Area (standard) .. Auxiliary Tables available	21" x 22"	31" x 31"	31" x 31"	48" x 54"
Height Under Spindle Nose (up) .. Added Height Available on Order.	48"	60"	75"	100"
Spindle Diameter	2⅜"	2¾"	2½"	2⅞"
Spindle Speeds Through Gear Box	4	4	4	8
Main Drive Motor (standard)	7½ hp	10 hp	15 hp	20 hp
Coolant Pump Volume, Motor Driven	14 gpm	18 gpm	18 gpm	25 gpm
Maximum Bore possible to hone with standard spindle drive motor	10" Dia.	12" Dia.	16" Dia.	20" Dia.
Maximum Overall Diameter of Cylinder possible to place on standard base	18"	27"	27"	44"
Floor Area	44"x60"	60"x80"	60"x80"	60"x108"
Overall Height	11'6"	15'3"	18'3"	23'8"

NOTE: Under our new policy of distribution, sales territories are being assigned to financially responsible, established dealers in the machine tool field. A few excellent territories are still open, and dealers are cordially invited to write us relative to sales representation.

AUTOMOTIVE MAINTENANCE MACHINERY CO.
2100 Commonwealth Avenue, North Chicago, Illinois

MECHANIZE
Your Screw Driving Army



PHILLIPS SCREWS PERMIT FAST DRIVING METHODS!

Like our fast-moving fighting forces, your screw driving army can now be mechanized to set new speed records on the assembly line.

You can have the advantages of power or spiral driving on almost any job . . . by adopting Phillips Recessed Head Screws. Automatic centering of driving force in the Phillips Recess eliminates the driving troubles that often make fast driving methods impractical. Fumbling, wobbly starts . . . slant-driven screws . . . broken-head screws . . . dangerous skidding of driver points . . . all are forgotten problems in plants that use screws with the Phillips Recessed Head.

Even "green hands" can do fast, skilled work. Savings of 50% in driving time are common. Such man-hour savings are important to the war effort, since so many workers in the average plant are driving screws.

They cost less to use! Compare the cost of *driving* Phillips and slotted head screws. You'll find that the price of screws is a minor item in your total fastening expense . . . that it actually costs *less* to have the many advantages of the Phillips Recess in your assembly work.

KEY TO FASTENING SPEED AND ECONOMY

The Phillips Recessed Head was scientifically engineered to afford:

Fast Starting – Driver point automatically centers in the recess . . . fits snugly. Screw and driver "become one unit." Fumbling, wobbly starts are eliminated.

Faster Driving – Spiral and power driving are made practical. Driver won't slip out of recess to injure workers or spoil material. (Average time saving is 50%.)

Easier Driving – Turning power is fully utilized by automatic centering of driver in screw head. Workers maintain speed without tiring.

Better Fastenings – Screws are set-up uniformly tight, without burring or breaking heads. A stronger, neater job results.

PHILLIPS *Recessed Head* SCREWS

WOOD SCREWS • MACHINE SCREWS SELF-TAPPING SCREWS • STOVE BOLT

21 SOURCES

American Screw Co., Providence, R. I.
The Bristol Co., Waterbury, Conn.
Central Screw Co., Chicago, Ill.
Chandler Products Corp., Cleveland, Ohio
Continental Screw Co., New Bedford, Mass.
The Corbin Screw Corp., New Britain, Conn.
The H. M. Harper Co., Chicago, Ill.
International Screw Co., Detroit, Mich.
The Lamson & Sessions Co., Cleveland, Ohio
The National Screw & Mfg. Co., Cleveland, Ohio
New England Screw Co., Keene, N. H.
The Charles Parker Co., Meriden, Conn.
Parker-Kalon Corp., New York, N. Y.
Pawtucket Screw Co., Pawtucket, R. I.
Pheoll Manufacturing Co., Chicago, Ill.
Reading Screw Co., Norristown, Pa.
Russell Burdsall & Ward Bolt & Nut Co., Port Chester, N
Scovill Manufacturing Co., Waterville, Conn.
Shakeproof Inc., Chicago, Ill.
The Southington Hardware Mfg. Co., Southington, Conn
Whitney Screw Corp., Nashua, N. H.

IT BETTER BE *NEW*— AND *NEWS*

This is new. And it's NEWS for every post-war planner. World's largest fractionating tower. It's all-welded. Sets a NEW high in fit-up tolerances and fractionating efficiency—a NEW low in oil refining cost.

ALTER EGO: Yes—and a NEW high in construction savings. Tower shell costs 30.7% less, weighs 15% less. Trays cost 30% less, weigh 54% less—because of arc welded construction.

That's the post-war pattern! The NEW product must be a better product at less cost. Be it vacuum tower or vacuum cleaner the NEW product must obsolete the old models. Otherwise it's a sales dud.

ALTER EGO: Right! To build metal products that will win post-war sales we've got to think about how WELDING is now building the ADVANCED fighting equipment for winning the war.

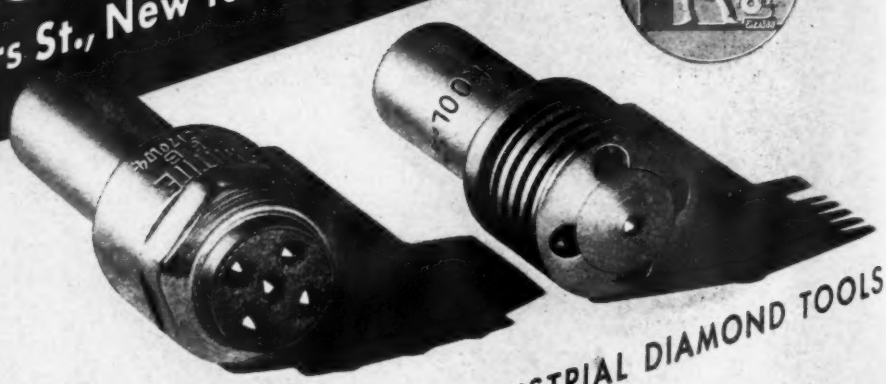
That IS something to start this post-war thought: Since we will have to fight WITH or AGAINST new models, let's plan the NEW by finding out from Lincoln what's NEW in arc welding—and how to apply it.

Ask your inner self whether old models will SELL after the war.

THE LINCOLN ELECTRIC COMPANY
CLEVELAND, OHIO

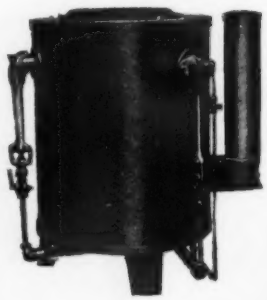
J. K. SMIT & SONS

157 Chambers St., New York, N. Y. 6400 Tireman Ave., Detroit, Mich.



INDUSTRIAL DIAMOND TOOLS

Atmospheric Pot Hardening Furnace



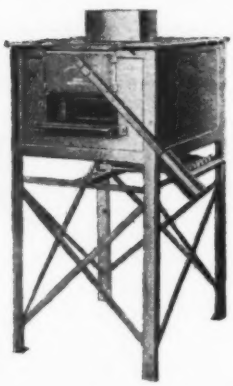
"BUZZER" HIGH SPEED *Gas* FURNACES

. . . are the efficient, economical answer to today's Heat Treating Problems. *NO BLOWER or OTHER AUXILIARY POWER are needed . . . just connect to your gas supply.*

- The Full Muffle Furnace attains a temperature of 2400° F., and The Pot Hardening Furnace, tangentially fired to assure even heat up 1650° F., are two of many models available.
- Send for the new "BUZZER" Catalog showing full line of Industrial Gas Furnaces, Burners and other equipment.

CHARLES A. HONES, INC.
121 So. Grand Ave. Baldwin, L. I., N. Y.

Full Muffle Furnace



Stuart's Thred Kut

For All Cutting Fluid Problems

AMERICA'S NO. 1 CUTTING OIL

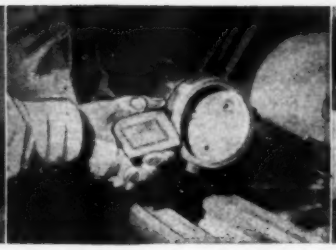
PROVED ON THE TOUGHEST CUTTING JOBS . . .

"THRED-KUT" is tops where applications call for the "toughest" cutting oil. In diluted form it saves money on average and easy jobs. It is used in manufacturing armories, arsenals, munitions plants, aircraft plants and all other industries that demand the most modern cutting oil. A long list of leading machine tool builders recommend "Thred-Kut" — they want their machines to have every advantage.

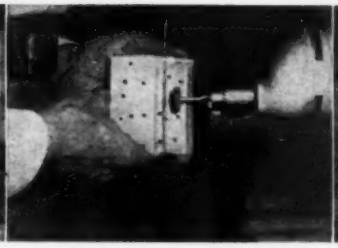
D. A. STUART OIL CO.
Chicago, U.S.A. • LIMITED • Est. 1865

Warehouses in Principal Metal Working Centers

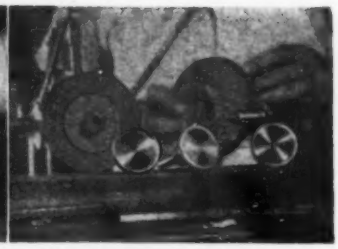
Smoothing and de-burring Dural and stainless steel welded part with Brightboy Wheel.



Cleaning and smoothing threads with Brightboy Hand Tablet.



De-burring — finishing holes and edges in Alclad part.



Cleaning—polishing tools, taps, dies, flush sets, drills, parts, in aluminum alloy, steel or brass.

the

ALL-STAR PERFORMER

in Faster, Easier

DE-BURRING

CLEANING

POLISHING

FINISHING

THE SOFT RUBBER BINDER CUSHIONS THE ABRASIVE

Resilient, "live" rubber binds and "cushions" Brightboy's abrasive all the way through!

The dimensional loss on the material being worked is reduced to a minimum—Brightboy is ideal for close-tolerance, precision work. A Brightboy-finished surface is so smooth that it frequently serves as the final polish. Brightboy bridges the gap *and saves the work operations* between a grind and a buff.

Brightboy removes light tool, heat and weld marks, scratches; smooths up joints. It is made in wheels, blocks, sticks, rods and special shapes for manual and machine operations. Easy to use. No special setups required.

Ask your dealer for catalogs and prices. Write us if he cannot supply you. Our service representative will be glad to call.

BRIGHTBOY INDUSTRIAL DIVISION
Weldon Roberts Rubber Co.,
Newark, N. J., U. S. A.

WELDON ROBERTS

Brightboy

REG. U.S. PAT. OFF.

Tool life greatly increased by reconditioning cutting oil *with* BARRETT OIL EXTRACTION SYSTEMS

Reports from plants using Barrett Oil Recovery and Reconditioning Systems show surprisingly high percentages in increased tool life. Then, too, users are enthusiastic as to the improved condition of the reclaimed oil as well as the high returns on the investment. Some set-ups in plants engaged on defense production have paid for themselves in a few months.

The Barrett Centrifugal Oil Extractor—which is part of a complete system—recovers 100% of the removable oil or 98½% of the contained oil from chips and turnings in 2 minutes or less. Complete Barrett oil recovery and reconditioning systems include Extraction, Sterilization and Sedimentation, together with filtration. The units involved are available in various sizes, individually or as a group, and are available with full manual control, semi-automatic control or with full automatic control requiring only loading, unloading, starting and stopping of the extractor by the operator. Complete plans including storage tanks for reclaimed oil or for use in conjunction with existing equipment are also available.

With the Barrett system, abrasive-free oil assuring longer tool life can always be depended on. With Barrett Sterilization and Sedimentation equipment, cutting oil is also safe and free from contamination.

Investigate Today by Sending for Descriptive Bulletin of Oil Recovery and Reconditioning Systems

Barrett Centrifugal Oil Extractor—the heart of Barrett Cutting Oil Recovery and Reconditioning Systems.

THE LEON J. BARRETT CO., WORCESTER, MASS.

Designers and Builders of Centrifugal Machinery

Is this YOUR Grinding Problem?

PRODUCING CLOSE WORK WITH FINE FINISHES

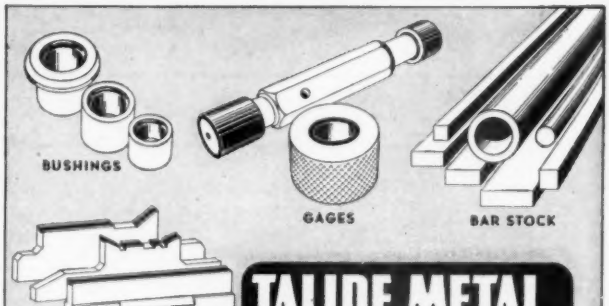
Leading concerns which have standardized on Oakite Grinding Compound for grinding all types of steel will tell you that it plays an indispensable part in obtaining better, more accurate work and smoother, finer finishes.

That is because Oakite Grinding Compound helps keep wheels clean, free-cutting . . . reduces loading and glazing . . . provides maximum cooling and proper lubrication . . . helps prevent rusting. FREE 20-page booklet gives formulas and directions. Write for it TODAY!

OAKITE PRODUCTS, INC., 24 Thames St., NEW YORK

Technical Service Representatives Conveniently Located in All Principal Cities of the United States and Canada

OAKITE CLEANING



TALIDE METAL..

Tools, Dies and Wear Parts

Tipped with TUNGSTEN CARBIDE are keeping war plants in constant, uninterrupted production, with the added advantages of . . .

- ★ Longer Life
- ★ Increased Output
- ★ Maintained Size
- ★ Closer Tolerance
- ★ Fewer Rejects

helping to complete vital War Contracts on time.

TALIDE TUNGSTEN CARBIDE Bar Stock is available in any size, diameter and length . . . for application to surfaces where wear and abrasion are troublesome.

Full Engineering Information on Request

TALIDE

METAL CARBIDES CORPORATION

YOUNGSTOWN, OHIO

TUNGSTEN CARBIDE TOOLS · DIES · WEAR PARTS

IF THESE WORKERS "Fumble" YOUR MACHINES STAND IDLE

Prominent numbering of the receptacles for small taps and plug and ring gages makes for speedy handling, minimum delay at the tool crib window in this efficient crib arrangement. *Photo courtesy General Electric Co.*

These swinging racks give ready access to reamers, maximum protection to each tool. Quick identification even for inexperienced help is assured by prominent labels in front. *Photo courtesy General Electric Co.*

Installed for temporary storage of small items, these oblong cans have given very satisfactory service. Composition containers might well be substituted if metal ones are not available. *Photo courtesy Brewster Aeronautical Corp.*

EVERY needless minute your costly machines stand idle between jobs means less production for you — and a longer war for all of us.

The photographs here may show you the way to an important saving. For each shows an arrangement that gets tools on the job with no waste of those precious minutes.

No one of these arrangements may fit *your* shop . . . but that's not the point. They may suggest a method adaptable to your requirements.

In checking your tool storage methods, keep these three fundamentals in mind:

1. A place for every tool, with a record to show its disposition when it's out.
2. An easily read and systematic means of identification.
3. Ample protection for keen cutting edges.

There are few places in your plant where careful planning will pay you more than your tool crib.

GTD GREENFIELD

TAPS • • • DIES • • • GAGES • • • TWIST DRILLS • • • SCREW PLATES

ARMY E NAVY

GREENFIELD TAP AND DIE CORPORATION

GREENFIELD, MASSACHUSETTS

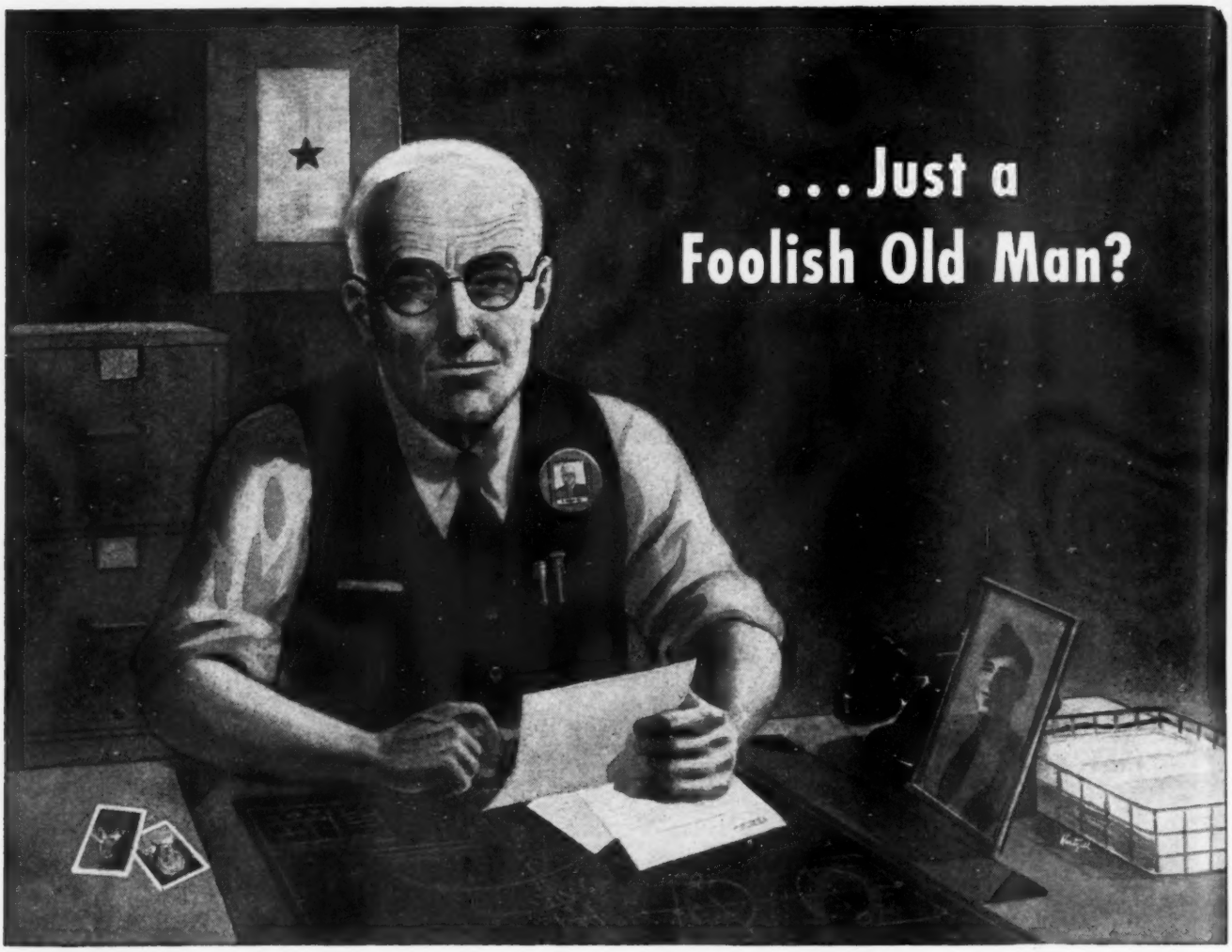
DETROIT PLANT: 5850 Second Boulevard

WAREHOUSES in New York, Chicago and Los Angeles

In Canada:

GREENFIELD TAP AND DIE CORP. OF CANADA, LTD., GALT, ONT.

Tool Conservation Begins in the Tool Crib



I COULD be on the sidelines, taking things easy, and maybe I should be. Maybe I should have quit my job last year, and started loafing on what I've saved. But, you see, I've got two boys and some grandchildren that mean a lot to me.

One of my boys, the youngest, is in the Army. The other one is married, and has a couple of kids. Like me, he is doing war work. So, even though I may be just a foolish old man, I can't help but feel a responsibility to my grandchildren, and to my grown-up sons.

Yes, I feel I should be doing something to help win this war so that my grandchildren and all kids can grow up, as I did, in a world that's free, like America, from want and hate and fear.

I want to see my son in the Army come marching home as soon as possible, too. And that's why I'm not taking it easy. That's why I'm working hard here at Morse. Maybe I'm foolish—thinking that I can help win the war—my job isn't big and important. But just the same there's always a chance that I might help produce a drive part that will save my boy's, or your boy's, life . . . there's a chance that something I do here at Morse might help win the war a fraction of a second sooner. And that's why, old as I am, I keep working.

THE MEN who work at Morse have the satisfaction of knowing that they are producing equipment vitally needed by our armed forces . . . equipment used in tanks, guns, ships and planes . . . and in their manufacture.

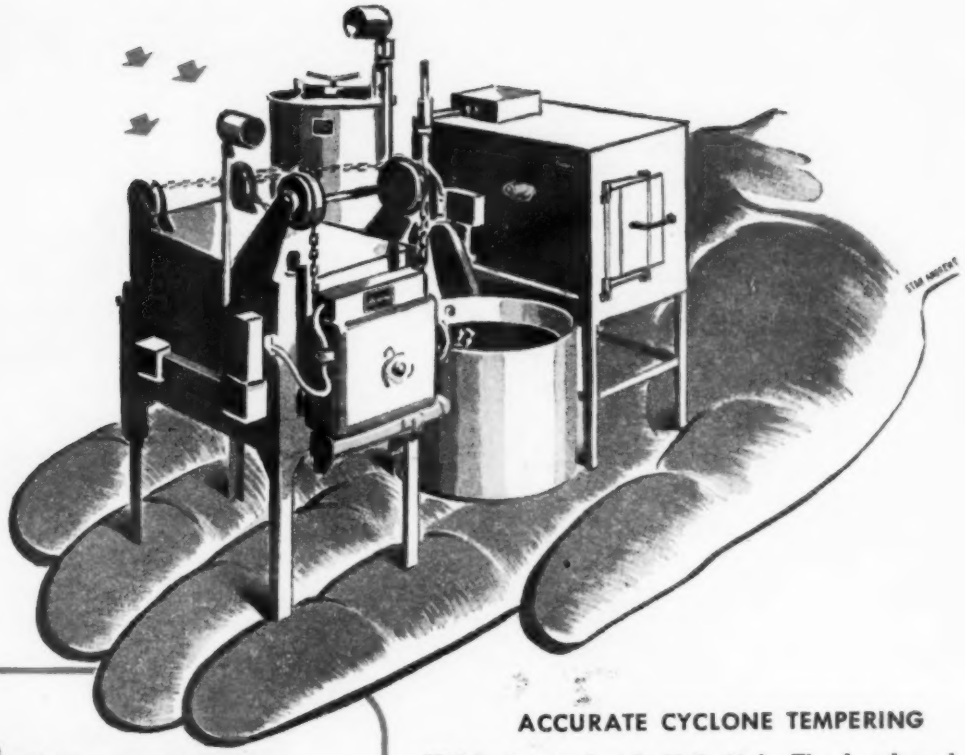
Of course, we know that Morse products, alone, won't win the war . . . but they are, on the other hand, helping a lot where needed. And with Americans, and American Industry, making an all out effort . . . the Axis is due for a terrific shellacking.

Your nearby Morse engineer can help you to solve your power transmission problems. He will be especially eager to do so if your problem is concerned with war production. Morse, with more than forty years' experience in the manufacture of power transmission equipment, makes silent chains, roller chains, sprockets, Morflex Couplings, radial couplings, silent chain couplings, roller chain couplings, free wheeling clutches, Pullmore multiple disc clutches, silent automotive timing chains, marine reduction gears and special drives engineered to the job. Inquiries are invited.

SILENT CHAINS ROLLER CHAINS FLEXIBLE COUPLINGS CLUTCHES

MORSE *positive* DRIVES

MORSE CHAIN COMPANY ITHACA, N. Y. DETROIT, MICH. DIVISION BORG-WARNER CORP.



Give your toolroom a HAND

Give a plus value to each of your tools and dies. Value in longer life. Value in time and money saved. Give your toolroom a boost with hardening and tempering furnaces that will heat treat each tool and die with the same precision that went into their making.

PRECISION HARDENING OF ALL TOOL STEELS

Tools and dies of even the "touchiest" tool steels, including highspeed, can be finished to size before heat treating when hardened in a Lindberg Hydryzing Furnace, because Hydryzing controlled atmosphere eliminates scale, decarb and carburization. This means that the parts have full, uniform hardness "as quenched" and the clean, hard surface saves the expense of costly grinding or polishing after heat treating.

ACCURATE CYCLONE TEMPERING

Hardening is but half the job. The hardened part should be tempered with equal accuracy to obtain its specified hardness. Key men in practically every toolroom in the country recognize the Cyclone Tempering Furnace for its rapid uniform heating. In fact, its heating and control accuracy is such that temper can be controlled to ± 1 Rockwell "C." And, too, you'll be amazed at its economy and efficiency of operation.

COMPLETE TOOLROOM SETUP

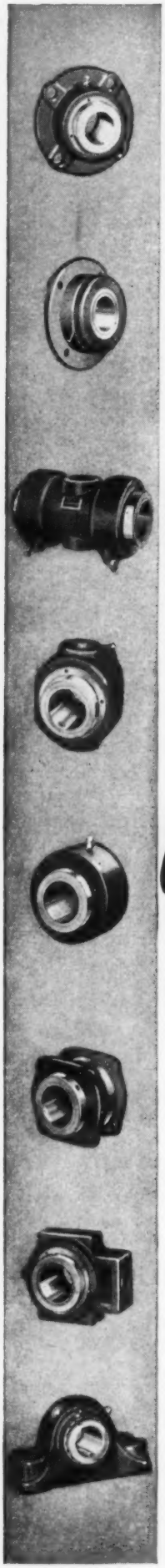
Lindberg can supply the finest available toolroom setup to meet any heat treating requirement, complete with quenching system. Write for Bulletin 94. It tells all the advantages of hardening with Hydryzing. And also ask for Bulletin 13. It shows why the Cyclone is the ideal tempering furnace for tools and dies.

LINDBERG ENGINEERING COMPANY
2445 WEST HUBBARD STREET • CHICAGO

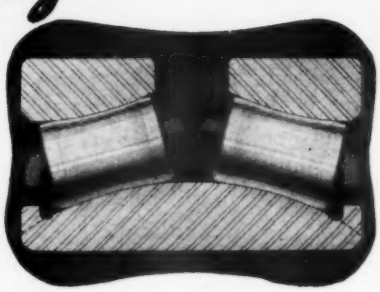
LINDBERG FURNACES

ARMY E NAVY

SUPER-CYCLONE for hardening, normalizing, annealing, tempering
CYCLONE for accurate, low-cost tempering and nitriding
HYDRYZING for scale-free and decarb-free hardening



Automatic Self-Alignment



Unique design assures high efficiency bearing performance

Note how this design provides self-alignment in the most efficient and economical way—within the bearing itself. Because this self-alignment is inherent in the design it is always available—naturally and instantly. Note the concave rollers and convex races. The inner race is a true spherical element, free to rotate in any direction without altering the contact between it and the rollers.

This inherent self-aligning feature permits unrestricted compensation for shaft deflection, misalignment or inaccuracies of installation, without altering the contact of rollers or disturbing the bearing action in any way, thereby assuring high efficiency under all conditions. Write for Book No. 1775. Link-Belt Company, Indianapolis, Chicago, Philadelphia, Atlanta, Dallas, San Francisco, Toronto. Branch offices, warehouses and distributors in principal cities. 9069

LINK-BELT

FRICTION FIGHTER BEARINGS

Roller and Ball Types

OWI Photo by Palmer, in an Allegheny Ludlum plant.

ALLOY AMMUNITION DUMP

FOR THE WAR MATÈRIEL BUILDERS

COILS of strip and stacks of sheet bars—Allegheny Ludlum Stainless and Electrical steels—how well the United Nations will use them.

As illustrated, these alloy steels are in the hot-rolled state. They're still a raw material. A great deal of careful and often highly involved processing—hot and cold-working, annealing, pickling and surface-finishing—must be done before they'll be ready to take their places on the war lines. But one day soon—correct to the exact physical, chemical or electrical properties required of them—these alloy steels will take their places in the planes, tanks, guns and ships of the fighting fronts. And always, it is a most essential and important place.

High-alloy steels are not ordinary materials. They are not produced, nor can they be used, in ordinary fashion. Above all, they must not be wasted through faulty selection, undue scrap losses, too high a percentage of rejects and spoilage, or any other reason that would prevent a fabricator from getting the maximum amount of war matèriel from every ton of alloy steels he uses.

That's both your and our responsibility, and we want to help in any way possible. Complete technical and fabricating data is available on all Allegheny Ludlum grades, as well as the personal assistance of our Technical Staff.

ADDRESS DEPT. AM-5

AL

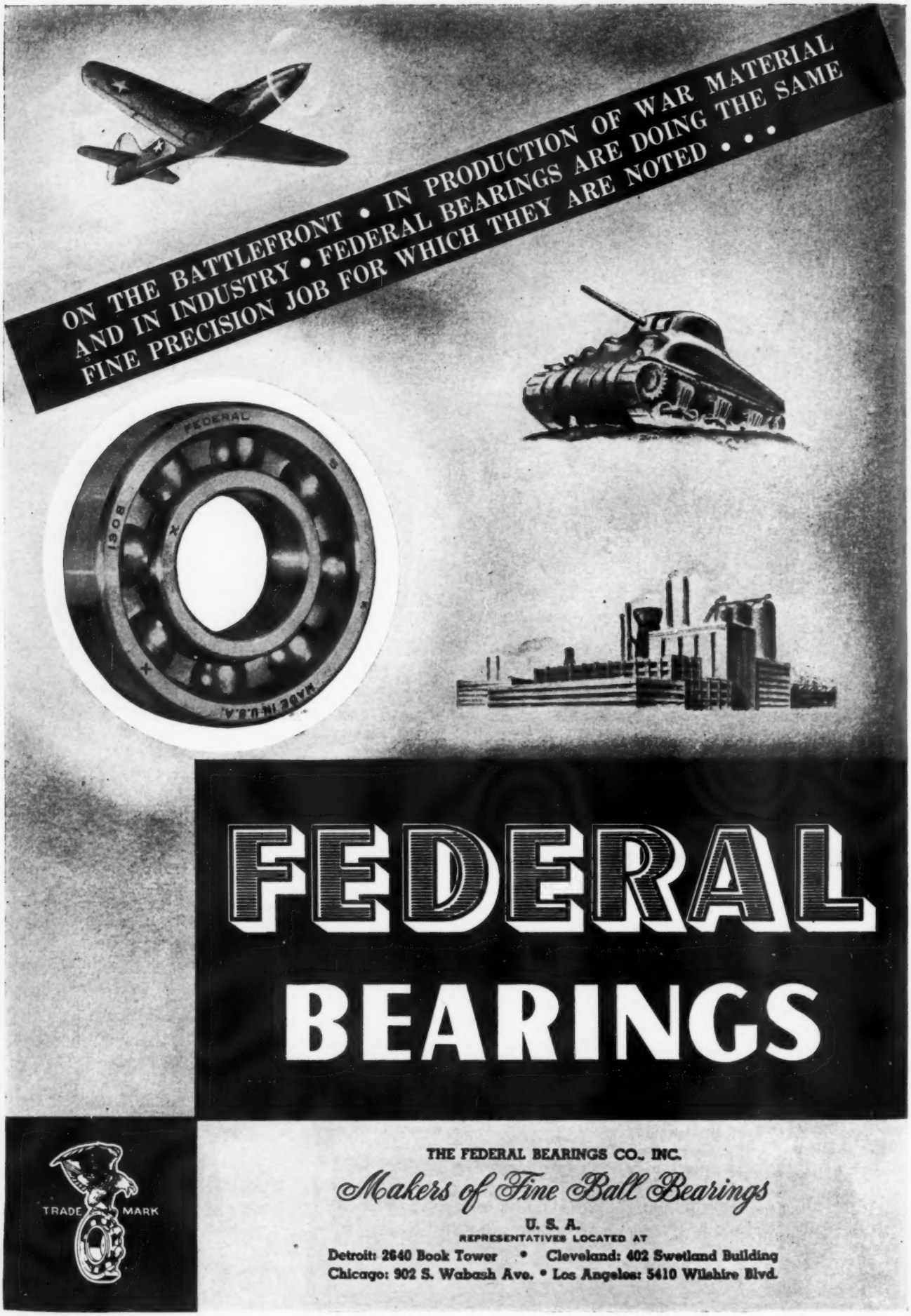
STEEL FOR THE NATION'S WELFARE

Allegheny Ludlum

STEEL CORPORATION

BRACKENRIDGE, PENNSYLVANIA

A-8864 . . . W & D


ON THE BATTLEFRONT • IN PRODUCTION OF WAR MATERIAL
AND IN INDUSTRY • FEDERAL BEARINGS ARE DOING THE SAME
FINE PRECISION JOB FOR WHICH THEY ARE NOTED • • •
FEDERAL
1908
MADE IN U.S.A.
FEDERAL
BEARINGS
TRADE MARK
THE FEDERAL BEARINGS CO., INC.
Makers of Fine Ball Bearings
U. S. A.
REPRESENTATIVES LOCATED AT
Detroit: 2640 Book Tower • Cleveland: 402 Swetland Building
Chicago: 902 S. Wabash Ave. • Los Angeles: 5410 Wilshire Blvd.

HIGHER speeds, closer tolerances, increased pressure, higher operating temperatures—all make the selection of correct lubricants a specialized problem. ● Now, more than ever, the correct lubricants must be used if increased production, low maintenance cost and maximum performance are to be obtained. ● The National En-Ar-Co White Rose Oils and En-Ar-Co Greases for all industrial purposes are complete and of the highest quality. These lubricants, engineered to meet every specialized requirement, are winning new laurels for outstanding performance where National recommendations have been followed. ● The National Refining Company maintains a staff of competent engineers and chemists who will be glad to work with you in maintaining your plant and equipment at its wartime best.

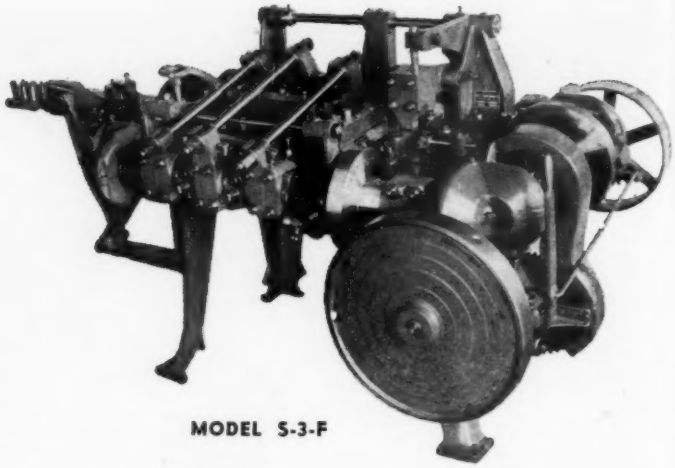
NATIONAL
EN-AR-CO
INDUSTRIAL
LUBRICANTS

THE NATIONAL REFINING COMPANY
Cleveland • Indianapolis • Chicago • Peoria • Omaha • Kansas City • Memphis
East of Ohio . . . **The Globe Refining Company, Cleveland, Ohio**

STEP UP PRODUCTION OF FORMED PARTS

. . . with the

NILSON AUTOMATIC METAL and WIRE FORMING MACHINES



MODEL S-3-F

Today's requirements for higher efficiency, greater speed and products of greater uniformity and accuracy are met in the new NILSON RIBBON STOCK FORMING MACHINES. These machines are the achievement of over fifty years accumulated experience in designing and building metal forming machines. Careful selection of materials and skilled workmanship result in machines that are famous for long life and low maintenance.

FEATURES THAT CONTRIBUTE TO BETTER, FASTER WORK

Superior features of the NILSON four-slide forming machines are the result of long experience and include:

. . . open construction of press and forming tools.
. . . patented slide feed which has an independent cam-operated wire gripping device.
. . . transmission of power operating wire feed through a straight line.

Send for 4-page circular giving further information as well as detailed specifications of sizes and capacities.

• •

We have been engaged in the design and production of special automatic machinery of high production capacity for over thirty years. We are prepared to render a complete service in connection with the design and production of automatic machinery of every description. Consult Nilson on your requirements.

THE A. H. NILSON MACHINE CO. . . . *Bridgeport, Conn., U.S.A.*

ALADDIN ROD

Patent No. 2055360 — NO FLUX — NO ACIDS

DOES IT QUICKER, BETTER, MORE ECONOMICALLY
WELDS ZINC BASE DIE CAST and BRAZES ALUMINUM

Repairs KIRKSITE and other zinc base dies, with die in either horizontal or perpendicular position. Unexcelled for use on sheet or cast aluminum, saves time and heat. Complete instructions with each pound. Sizes 1/16", ⅛", 3/16" & ¼" also complete assorted lb. WRITE FOR FREE LITERATURE.

ALADDIN ROD & FLUX MFG. CO.
Box 935 Mad. Sq. Sta., Dept. G — Grand Rapids, Mich.

ACROMARK

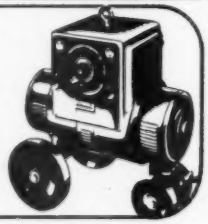
Numbering, stamping and marking machines and accessories are extensively used where fast, accurate permanent work is a prerequisite.

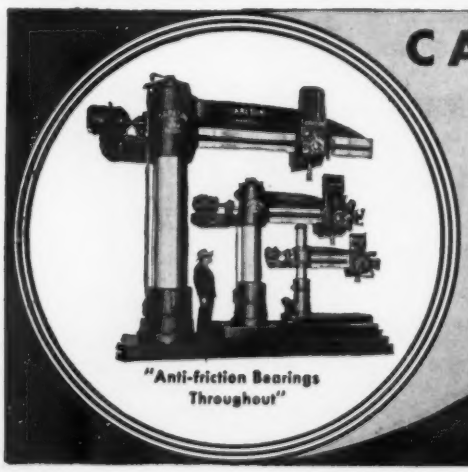
THE ACROMARK CO. ELIZABETH NEW JERSEY

Hobart — *"Simplified" ARC WELDERS*

America's successful production race was largely dependent on the world's greatest corner-cutting tool...arc welding. Hobarts have been the pace-setters: for you find them in small machine shops and million dollar industries the country over. They're speeding work, saving metals, making stronger tanks, planes, guns, trucks and ships.
Hobart Bros., Box 429, Troy, O.

"One of the World's Largest Builders of Arc Welders"





"Anti-friction Bearings Throughout"

CARLTON RADIAL DRILL

FEATURES — 1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

The **CARLTON**
MACHINE TOOL COMPANY
CINCINNATI, OHIO, U. S. A.

ARMY E NAVY

Meehanite Foundries

Allentown, Pa.
Traylor Engineering Company

Ansonia, Conn.
Farrel-Birmingham Co., Inc.

Bridgewater, Mass.
The Henry Perkins Co.

Brooklyn, New York
E. W. Bliss Company

Buffalo, N. Y.
Pohlman Foundry Co., Inc.

Charleston, W. Va.
Kanawha Manufacturing Co.

Chattanooga, Tenn.
Ross-Meehan Foundries

Chicago, Ill.
Greenlee Foundry Company

Cincinnati, Ohio
Cincinnati Grinders Incorporated
The Cincinnati Milling Machine Co.

Cleveland, Ohio
Fulton Foundry & Machine Co.

Denver, Colo.
The Stearns-Roger Mfg. Co.

Detroit, Mich.
Atlas Foundry Co.

Flint, Mich.
General Foundry & Mfg. Company

Hamilton, Ohio
The Hamilton Foundry & Machine Co.

Hamilton, Ontario, Canada
Otis-Fensom Elevator Company

Irvington, N. J.
Barnett Foundry & Machine Co.

Jeannette, Pa.
Elliott Company

Lewisburg, Tenn.
Marshall Stove Company

Los Angeles, Calif.
Kinney Iron Works

Milwaukee, Wis.
Koehring Company

Mt. Vernon, O., Grove City, Pa.
Cooper-Bessemer Corporation

New Rochelle, N. Y.
Meehanite Metal Corporation

New York, N. Y.
The American Brake Shoe & Foundry Co.

Oakland, Calif.
Vulcan Foundry Company

Orillia, Canada
E. Long, Ltd.

Philadelphia, Pa.
H. W. Butterworth & Sons Co.
Florence Pipe Foundry & Machine Co.,
(R. D. Wood Company, Selling Agents)

Phillipsburg, N. J.
Warren Foundry & Pipe Corp.

Pittsburgh, Pa.
Rosedale Foundry & Machine Co.

Rochester, N. Y.
American Laundry Machinery Co.

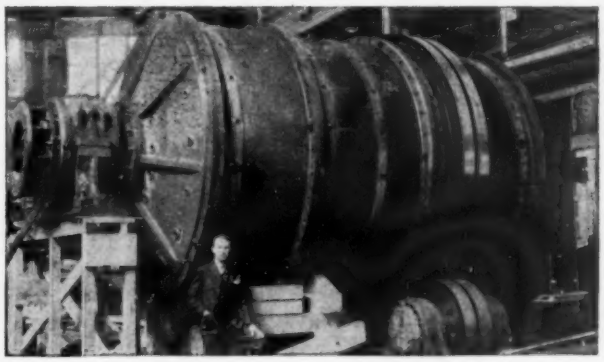
St. Louis, Mo.
Banner Iron Works

St. Paul, Minn.
Valley Iron Works

London, Eng.
The International Meehanite Metal Co., Ltd.

Waterloo, N. S. W.
Australian Meehanite Metal Co., Ltd.

Johannesburg, South Africa
Meehanite Metal Co. (S.A.) (Pty.) Ltd.



This 9 foot x 12 foot Marcy Mill, cast in Meehanite, carries a ball load of 50 tons. Weight on each trunnion—70 tons.

Meehanite WEAR-RESISTING CASTINGS

ARE TOUGH • SOLID • UNIFORM

One of Meehanite's outstanding fields of service is in Wear-Resisting applications. Meehanite castings are a particularly good choice for many such jobs, because their wear-resisting properties can be combined with other desirable features such as high strength, vibration absorption, self lubricating properties, easy machinability, and dependably uniform density and solidity.

5 DIFFERENT WEAR-RESISTING TYPES

Meehanite castings are available in five distinct Wear-Resisting types. Several types are needed because the properties required for various applications change with the type of service. Certain Stamping Dies, for example, might require very different metallurgical characteristics than truck brake drums. In the various types of Meehanite you can obtain: a tough, dense cast metal of high endurance limit; or castings, which when heat treated are file hard and have good anti-friction qualities; or a material particularly suited for ordinary abrasion resistance; or a casting chilled to a hard surface and tough back; or an extremely hard material for resisting the abrasive action of granite, carborundum, coke, etc.

METALLURGICAL CONTROL ASSURES DEPENDABILITY

The strict control of physical properties, a dominant characteristic of the Meehanite manufacturing processes, gives you the type of Meehanite best suited to your particular needs. The nearest Meehanite foundry will gladly give you full information on Wear-Resisting or other types of Meehanite castings.

MEEHANITE RESEARCH INSTITUTE • New Rochelle, N. Y.

MEEHANITE
SEND FOR BOOKLET

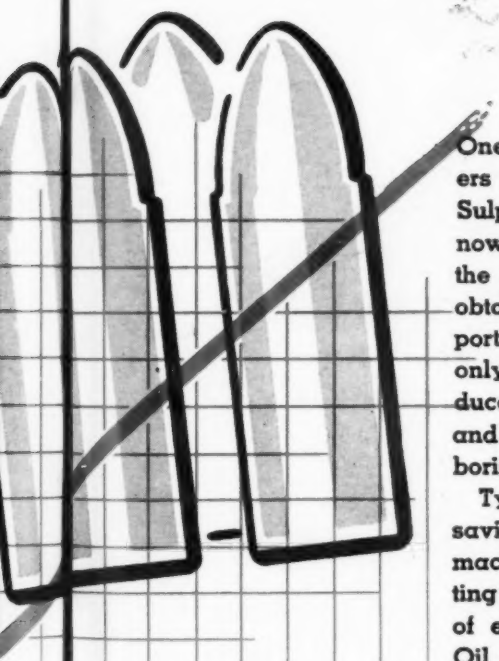
Engineering Data Book, free to executives, engineers, designers, production men. Price to others, $1.00 per copy.

AMMUNITION PRODUCTION

TIDE WATER ASSOCIATED

...INCREASED...

...FROM 4 TO 22 SHELLS BETWEEN TOOL GRINDINGS BY SWITCHING TO TYCOL CUTTING OIL...

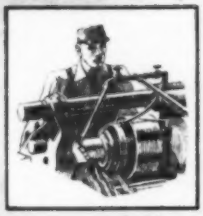


One of America's largest ordnance manufacturers reports that, since changing to Tycol 678 Sulphurized Soluble Oil, 22 large shells are now bored between tool grindings, whereas with the oil previously used, only 4 borings were obtained. You can readily understand the importance of such cutting oil performance. Not only are machining interruptions drastically reduced, thus materially increasing production and saving many man-hours, but more accurate boring and finer finishes are assured.

Tycol Cutting Oils are increasing production, saving man-hours and material in thousands of machining operations ranging from heavy cutting to high speed automatic machining on metals of every analysis. There is a Tycol Cutting Oil specifically suited to your cutting requirements. Let a Tide Water Engineer recommend an oil to help you do your job better and faster.

DRUMS! DRUMS! DRUMS!
War needs make it extremely important that all empty drums be returned immediately.

FASTER CUTTING
—The better cooling and lubricating job performed by Tycol Transparent Sulphurized Cutting Oil is effecting material savings in time and enables greater output even on the toughest of steels.



LONGER TOOL LIFE
—Tools that work under Tycol Cutting Oil have a long useful life. Regrindings are cut materially and the problem of chips welding to the tool is minimized.

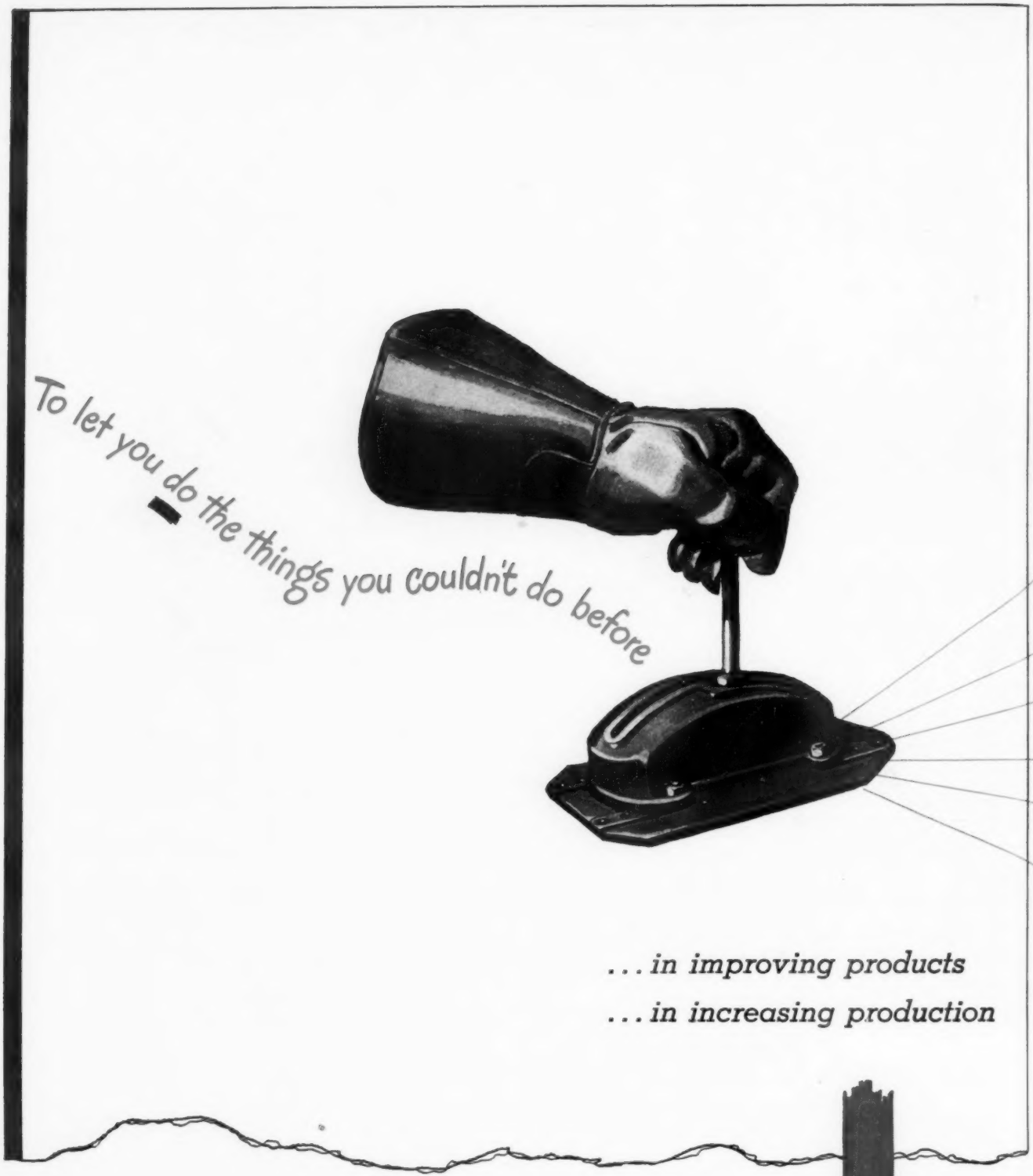
FINER FINISHES
—Tide Water Transparent Cutting Oil is unique among sulphur base cutting oils in that it does not tarnish the work. This important consideration led thousands of machine tool users to insist on Tycol.

EDOIL COMPANY

INDUSTRIAL TYCOL OILS-GREASES

MAKERS OF THE FAMOUS VEEDOL MOTOR OIL
EASTERN DIVISION: 17 BATTERY PLACE, N.Y.C.

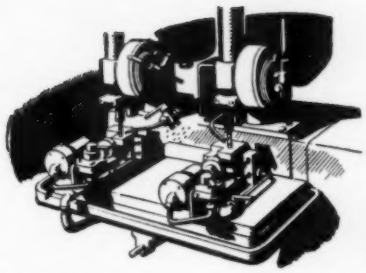
Principal Branch Offices: Boston, Philadelphia, Pittsburgh, Charlotte, N.C.
TIDE WATER OIL COMPANY OF CANADA, LTD., Toronto — Montreal

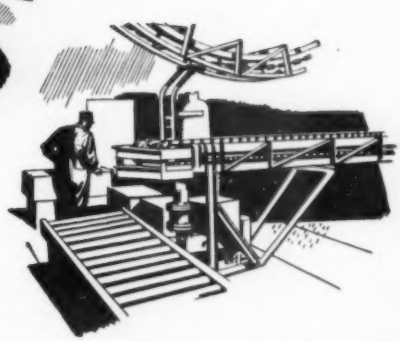


If the improvement of your product or the increasing of your plant production is hampered by some remote control problem . . . this is one of the most important messages you ever read.

Stimulated by the needs of war, W·A·B Remote Control Systems are now at work in new and broader fields. The experience gained in three quarters of a century of railroad applications is now helping to improve output and better performance on ships, in earth moving machinery, in cranes, in mining and drilling equipment, in manufacturing plants. This experience can help you to do some things you couldn't do before.

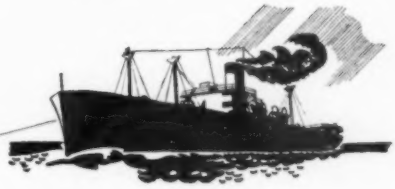
No one example can tell the complete story, for these systems are not "package" propositions; each is engineered to fit some specific need. But one important current application may suggest the possibilities.





Already installed on a number of vessels, these W·A·B Remote Control Systems place command of all engine maneuvering directly under the thumb of the operator. Control—from stations located on the bridge, in the engine room, or both—is almost as centralized and simplified as the control of your car. Both speed and precision of response are greatly increased.

W·A·B Remote Control Systems—Pneumatic, Pneumatic-Electric, and Pneumatic-Hydraulic—combined rugged dependability with flexibility and precision. The slightest movement of the graduating control produces a proportionate movement of the operating mechanism. Where a fixed cycle of operations is desired, timing is at the will of the operator . . . but sequence cannot be varied through ignorance or error. Safety or limiting devices can generally be directly interlocked, without complicated auxiliary equipment. There is no lost motion or over-run, and continued use does not impair accuracy.

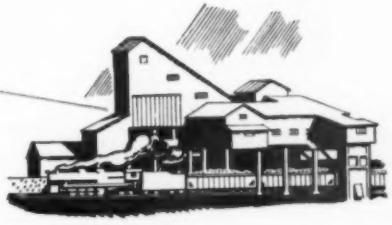


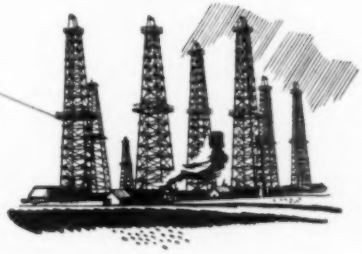
You can tell, better than anyone else, where W·A·B Remote Control Systems might fit into your plant or product. In many instances, standard "off the shelf" W·A·B devices provide a complete solution to control problems. Our representatives will be glad to cooperate in applying W·A·B experience to the development of a system engineered to meet your specific needs. Write, wire or phone.

Westinghouse Air Brake Company

INDUSTRIAL DIVISION

General Offices: Wilmerding, Pa.

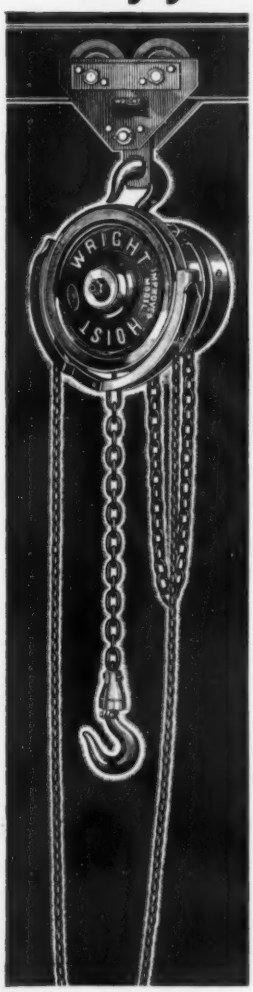




W·A·B PNEUMATIC PNEUMATIC-ELECTRIC PNEUMATIC-HYDRAULIC **Remote control systems**

WRIGHT
Improved High Speed
HOISTS

Buy your load chain a drink!



Believe it or not, mister, a well-lubricated load chain will outlast a dry chain **fifteen times.** That sounds incredible, but it's true. You see, every link has a bearing area where it meets its neighboring links. Unless there is a protecting film of oil at these points, the friction will cause undue wear. Another place where the protection of oil is needed is when the chain comes in contact with the load wheel.

... But let's go back to the chain itself. A dry chain wears prematurely —lengthens itself out of pitch. And a chain out of pitch cannot seat itself properly in the wheel sockets. Another vicious result of wear.

... So please—now that all steel products are critical—lubricate your load chain regularly and make it last; twice, five times, ten times, yes—**fifteen times** as long.

Send today for a free copy of the Wright Crane Signal Chart. This chart (36" x 24") can be tacked up on the bulletin board to teach the men standard crane signals which will speed operation and promote safety.

WRIGHT MANUFACTURING DIVISION
York, Pa., Chicago, San Francisco, New York
AMERICAN CHAIN & CABLE COMPANY, INC.
BRIDGEPORT, CONNECTICUT

ACCO *In Business for Your Safety*

ARMY E NAVY
FLYING OVER THE WRIGHT HOIST PLANT

Get the same quick training for using MATHEMATICS on the job THAT FORD SHOP MEN GET in your spare time at home!

Here is an easy way to learn the special mathematics needed today by all mechanics for the solving of everyday shop problems. Already thousands have been successfully and rapidly taught by this simple system in the Ford Motor Company Schools. The mathematical background it helps you acquire in your spare time is exactly the practical kind you need to handle work better and to get ahead faster.

SIMPLIFIED INDUSTRIAL MATHEMATICS

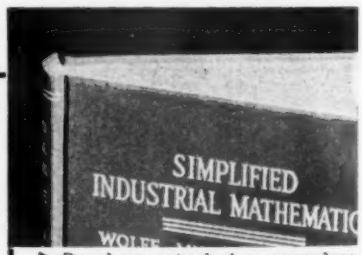
By J. H. Wolfe, Supervisor of Ford Apprentice Training; W. F. Mueller, Principal of Ford Aircraft Apprentice School; and S. D. Mullikin, Principal of Ford Airplane Apprentice School.

281 pages, 5½x8, 126 illustrations, $2.00

Here is helpful instruction that gives you a quick working knowledge of the mathematics needed to handle trade and industrial problems, and which develops your ability to apply it to the day-to-day problems met with in all types of industrial work. Written plainly and understandingly, the book is especially designed for the technical training of skilled and semiskilled craftsmen whose trade requires direct application of mathematical knowledge.

These 14 chapters make shop mathematics easy for you

1. Common Fractions
2. Additions and Subtraction of Decimals
3. Multiplication and Division of Decimals
4. Square Root
5. Precision Instruments
6. Grouping Symbols and Formulas
7. Ratio and Proportion
8. Tapers
9. Percentage
10. Geometry
11. Trigonometry: Right Angles
12. Trigonometry: Oblique Triangles
13. Screw Threads
14. Gears



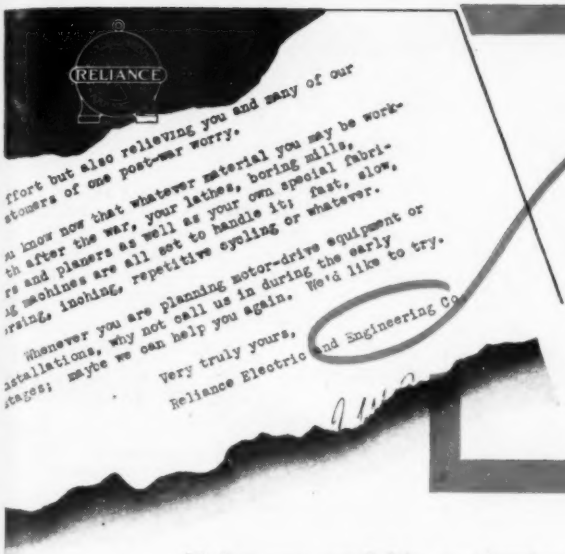
▶ Based on actual shop procedure, rather than on the usual formal proof found in most mathematics texts, this book clearly explains arithmetic, precision instruments, geometry, trigonometry, screw threads, and gearing—and tells how to use them on your own job.

10 DAYS' FREE TRIAL

McGraw-Hill Book Co., Inc.,
330 West 42nd Street, New York

Send me Wolfe, Mueller and Mullikin's Simplified Industrial Mathematics for 10 days' examination on approval. In 10 days I will send you $2.00 plus few cents postage or return book postpaid. (Postage paid on cash orders.)

Name .....
Address .....
City and State .....
Position .....
Company .....A. 4-29-43


RELIANCE
ffort but also relieving you and many of our
stomers of one post-war worry.
u know now that whatever material you may be work-
th after the war, your lathes, boring mills,
rs and planers as well as your own special fabri-
g machines are all set to handle it; fast, slow,
rsing, inching, repetitive cycling or whatever.
Whenever you are planning motor-drive equipment or
stallations, why not call us in during the early
stages; maybe we can help you again. We'd like to try.
Very truly yours,
Reliance Electric and Engineering Co.

These two words make motor-drive more than power!

Today you need big production, high quality.

Tomorrow? The same requirements, probably; but with new methods and processes.

Fortunately, in your motor-driven equipment you can meet today's needs and, at the same time, be preparing for tomorrow's unknown demands. It takes good motors AND ENGINEERING.

Adapted to your needs, Reliance motor-drive can do *many things* for you.

If you design or use motor-driven machines or equipment, you need to get the right answer to this question: *"What can we make a motor do besides supply power?"*

Reliance Application Engineers—production-minded men with wide experience in providing flexible power and control through the use of motor-drive—can help you get the answer.

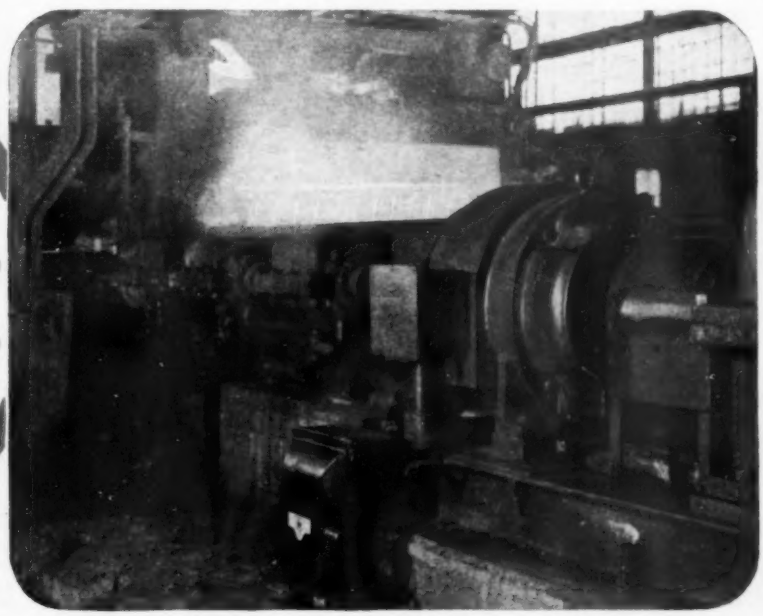
You will like the way they work. Just phone or write to our nearest office.

Motor-drive provides within itself a means of:

Speed Control	Reversing
Braking	Remote Control
Tandem Operation	Controlled Acceleration
Tension Control	Safety

Slow Speeds for inching, threading, inspection

Applying them to boost production and improve quality is APPLICATION ENGINEERING. That's our business.



A Reliance 50 hp. Squirrel-cage motor, specially designed to operate the geared table between stands of this hot blooming mill, is demonstrating decided advantages over the d-c. mill-type motors customarily used—lower initial cost, simpler parts and less "time-out" for maintenance; splash-proof to withstand flying scale; rugged, with roller bearings, to withstand continual starting, stopping and reversing as the bloom is manipulated.

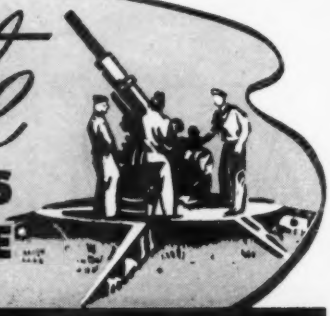
RELIANCE ELECTRIC & ENGINEERING CO.
1088 Ivanhoe Road • Cleveland, Ohio

BIRMINGHAM • BOSTON • BUFFALO • CHICAGO
CINCINNATI • DETROIT • GREENVILLE, S. C.
HOUSTON, TEX. • LOS ANGELES • MINNEAPOLIS
NEW YORK • PHILADELPHIA • PITTSBURGH
PORTLAND, ORE. • ST. LOUIS • SAN FRANCISCO
SYRACUSE, N.Y. • AND OTHER PRINCIPAL CITIES

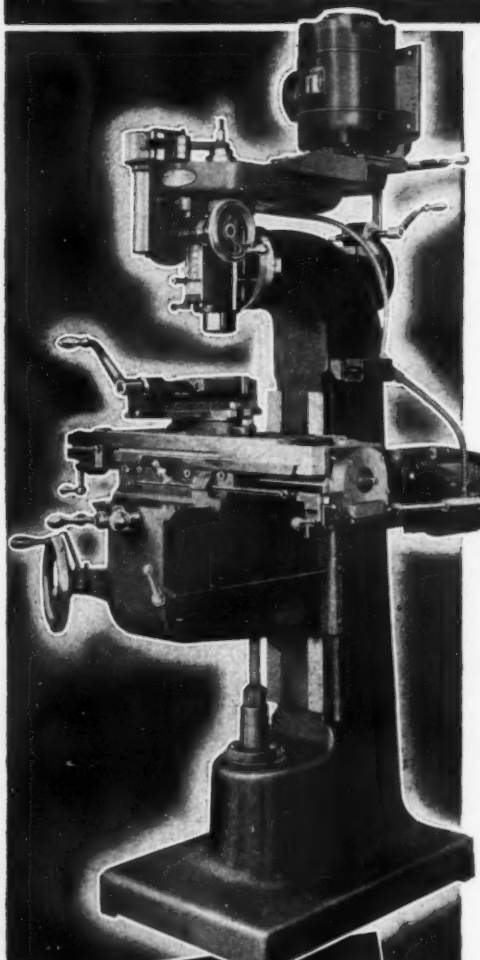
RELIANCE A-C D-C MOTORS

Accurate

AS THE GUNS THEY HELP PRODUCE



INDEX MILLS



Manufactured by Index Machine and Tool Co. Jackson, Michigan

CHECK THESE FEATURES!

★ Precision Ball Bearing Spindle that will require no attention for two years.

★ Swivel Head which can be set 90° right or left.

★ Super construction sensitive enough to do work with end mills 1/8" diameter yet rugged enough to use 3/4" end mills taking full cuts 24 hours a day.

★ Verniers for locating, and power feed to spindle for boring.

★ A versatile machine that can be used in the tool room or on the production line.

Send inquiries for immediate quotation and quick delivery to Factory Sales and Distributing Agents.

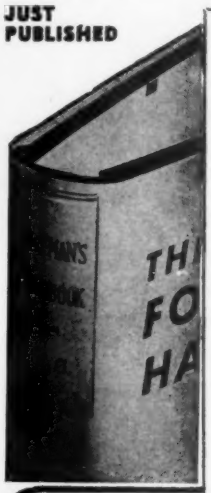
BLANK and BUXTON MACHINERY

3100 E. MICHIGAN AVE.
JACKSON, MICHIGAN

Methods, data, principles that effective foremen are using now--

Here is a working tool to help you in running your department—a real handbook that gives you in concise, usable form the working data, the actual proved methods, and the carefully-sifted background information every line foreman needs today to make the most of his job.

JUST PUBLISHED



18 SPECIALISTS

wrote this book especially for foremen

Carl Heyel
A. L. Kress
T. O. Armstrong
Lawrence L. Bethel
Phil Carroll, Jr.
Charles Reitell
Glenn Gardiner
Roger Williams
Howard W. Haggard
Lydia G. Gibersen
H. P. Dutton
Samuel L. H. Burk
R. S. Driver
Charles A. Drake
Lewis K. Urquhart
Robert Wray Porter
James J. Bambrick, Jr.
Robert O. Pickard

THE FOREMAN'S HANDBOOK

Edited by CARL HEYEL

410 pages, illustrated, $3.00

18 helpful chapters

A Breakdown of the Foreman's Job
The Foreman as a Leader
Quality Control and Waste Reduction
Planning and Scheduling
Time Study and Methods Improvement
Cost Control by Foremen
The Foreman's Training Responsibilities
What to Do About Safety
Industrial Fatigue
Special Problems in Supervising Women
Modern Wage-payment Plans
Job Evaluation
Merit Rating of Employees
The Tools of Industrial Psychology
The Background of Scientific Management
Forms of Industrial Organization
What the Foreman Should Know About Economics
What the Foreman Should Know About Labor Legislation

This authoritative reference book emphasizes the kind of practical information a foreman needs in his work, to make the most of his job and to develop it beyond the point at which he assumed it. It covers every phase of the foreman's functions, from direct day-to-day responsibilities in handling people and supervising production to the background of economic, legislative, and management fundamentals needed in winning advancement. How do other foremen handle the kind of "headaches" that come to you? You can get the answers—right answers, based on proved experience in representative plants—from this great new handbook.

ASK TO SEE IT 10 DAYS FREE

SEND THIS ON-APPROVAL COUPON

McGraw-Hill Book Co., 330 W. 42nd St., N. Y. C.
Send me Heyel—The Foreman's Handbook for 10 days' examination on approval. In 10 days I will send $3.00, plus few cents postage, or return book postpaid. (Postage paid on cash orders.)

Name .....
Address .....
City and State .....
Position .....
Company .....FA. 4-20-43

CENTURY
Mechanically and Electrically Balanced
MOTORS

Are Remarkably Free From Vibration

Century Motors' unusual freedom from vibration and exceptionally quiet operation are the result of careful electrical and mechanical balancing. In machine tool applications this contributes much to the accuracy of the work produced and is an important factor in prolonging motor life.

1. Century rotors are dynamically balanced on both ends.
2. The electrical and magnetic circuits are symmetrically constructed to produce an even torque.
3. Slots are skewed to produce a steady torque — eliminating jerks.
4. Cushion bumpers deaden the thud of the shaft shoulder against the bearing when the rotor moves lengthwise.
5. Sleeve bearings are diamond bored for accuracy after they are assembled in the end bracket.
6. Bearing surfaces on the shaft are ground to close tolerances and highly polished.

Such details of Century engineering, design, and construction help to produce quieter, free-running motors. Whatever the application, there are Century Motors built to stand up under the toughest demands of present day production.

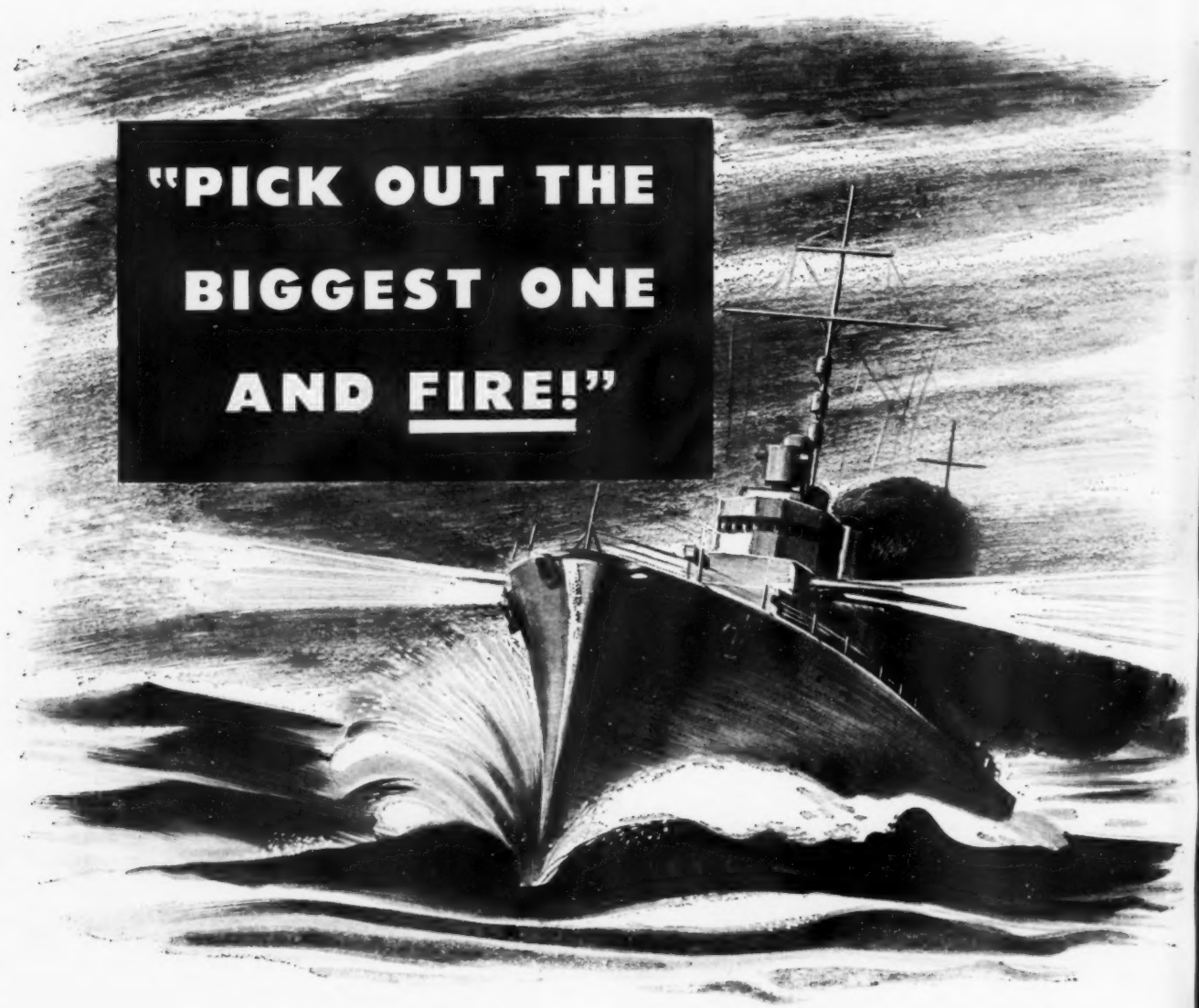
Your nearest Century Application and Service Engineer will gladly give you full details on all the advantages of Century Motors — help you to select the correct motor to meet practically every application demand.

CENTURY ELECTRIC COMPANY
1806 Pine Street St. Louis, Missouri
Offices and Stock Points in Principal Cities

309

Century MOTORS 1/6 to 600 horsepower

One of the Largest EXCLUSIVE Motor and Generator Manufacturers in the World



● *Fighting words . . spoken by a real fighting man.*

In 27 minutes of furious, nerve-tearing action off Guadalcanal, on the night of October 11-12, the U.S.S. Boise engaged a task force consisting in part of two Jap heavy cruisers, one light cruiser, and three destroyers . . and she sank them all!

"Pick out the biggest one . . and fire", was the order of the skipper . . and the Boise never stopped firing until victory was hers. ★ Equipment on the Boise, by Bayard, includes Boat Cranes and Airplane Crane. Proudly, every man in the Bayard organization has dedicated himself to "active duty" for the duration, producing deck machinery and equipment to help win the war!

BAYARD

M. L. BAYARD & CO., INC. • ENGINEERS AND MACHINISTS PHILA., PA.

The star of continued achievement has been added to the Navy "E" Pennant flying over the Bayard plant.

NICKEL AIDS THE AERONAUTICAL INDUSTRY

to KEEP 'EM FLYING!

The design engineers of the aeronautical industry have repeatedly met demands for improved aircraft to serve on world-wide fighting fronts. At the same time the industry has been able to turn out huge quantities of highly complex precision mechanisms on a mass-production basis.

Since the pioneer days of the aviation industry, it has made extensive use of materials containing Nickel for engine and fuselage parts. In these applications the industry's engineers have developed to the fullest extent the useful and unique properties contributed by Nickel to the materials commonly used in aircraft construction.

The continued widespread use of Nickel reflects confidence based on innumerable satisfactory performance records.

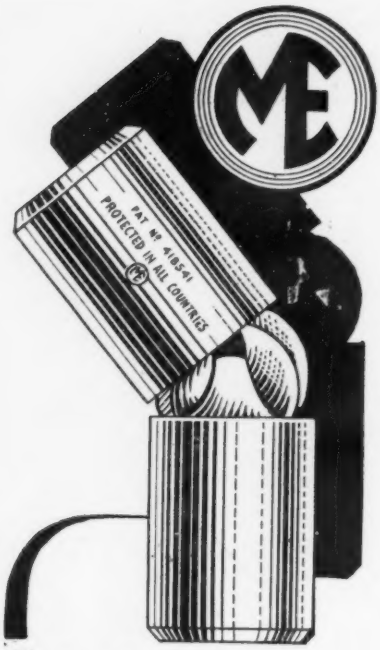
On all fronts, pilots and maintenance crews are learning what metallurgists long have known. Properly used, a little Nickel goes a long way toward assuring the dependable performance of aircraft. From valves to drive gears, and from crankshafts to manifolds, modern aircraft perform more dependably because of the added strength, toughness and resistance to corrosion Nickel imparts to other metals.

The technical staff of International Nickel has been privileged to cooperate with the aeronautical engineers who have accomplished so much toward the improvement of aircraft. These engineers and metallurgists offer counsel and data to all who desire assistance in the selection, fabrication and heat treatment of ferrous and non-ferrous metals.

★ **Nickel** ★

Send for lists of available publications. Address your inquiries to Technical Library Service

THE INTERNATIONAL NICKEL COMPANY, INC., *67 Wall St., New York, N.Y.*



Patent

UNIVERSAL BALL JOINTS

- Made in a range of 9 sizes for shaft diameters ¼" to 1⅝".
- Standard Joints have maximum angle of 38° from the straight line.
- Made by the largest manufacturers of UNIVERSAL JOINTS in Great Britain.
- Widely used in Machine Tools, accessory drives and on Aircraft.
- Certified 92% to 98% efficient by the British Government's National Physical Laboratory.

Catalogues on request,

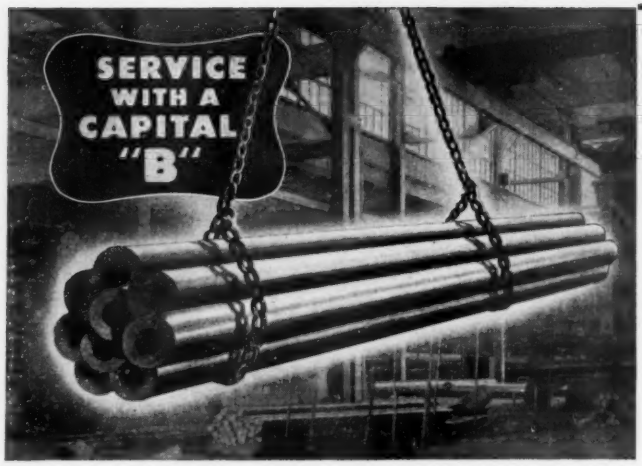
The

MOLLART

Engineering Co., Ltd.

KINGSTON BY-PASS, SURBITON, SURREY, ENGLAND.

Telegrams: PRECISION, SURBITON,



The "B" stands for Bissett, of course, for it was Bissett service which made possible the prompt delivery of the bored shafts shown above. These 9 shafts—14 feet long with 7½" O.D. and 4" I.D.—were supplied to a war plant completely machined, heat treated and ready for use.

Would service like this simplify your buying? Get in touch with us.

BUY WAR BONDS!

NORMALLY CARRIED IN STOCK

N.E. Steels and Standard S.A.E. Steels, both Carbon and Alloy, Hot Rolled and Cold Drawn

★ Chisel Steels

★ Cumberland Ground Shafts

★ Drill Rod

★ High Speed Tool Bits

★ Shim Steels

★ Tool Steels

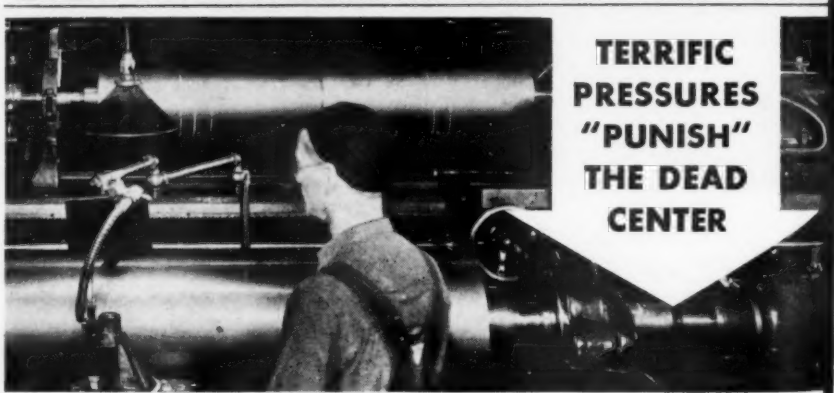
★ Tool Steel Tubing

★ Boiler Tubing

MAIN OFFICE & WAREHOUSE
947 E. 67TH ST. • CLEVELAND
TELEPHONE HENDERSON 0993

the **BISSETT** *steel company*

DIRECT MILL REPRESENTATIVES SINCE 1920



TERRIFIC PRESSURES "PUNISH" THE DEAD CENTER

Heavy cuts . . . high speeds . . . pressure between dead center and work raise havoc with the "center". The one lubricant that "can take it" is

DIXON'S LATHE CENTER GRAPHITE LUBRICANT

Made especially to lubricate dead centers . . . Saves center and work . . . Reduces spoilage . . . Increases production and accuracy by permitting tighter setup, often permitting heavier cuts and higher speeds . . . Also a general utility extreme pressure lubricant of amazing film strength . . . Try it.

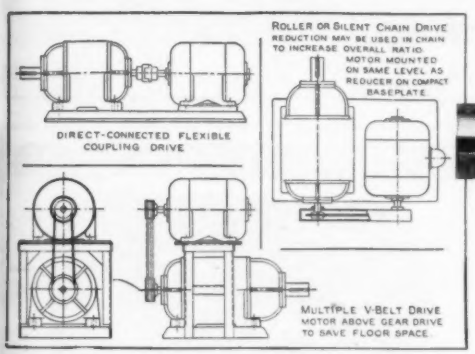
From your distributor in 1, 4 and 8-oz. tubes—or write for printed RLC4.

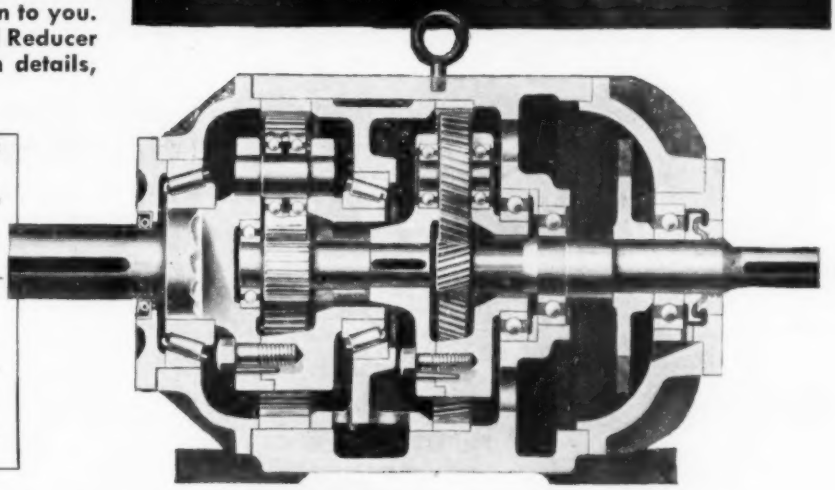
JOSEPH DIXON CRUCIBLE CO., JERSEY CITY, N. J.
Send information on your Lathe Center Graphite Lubricant.
NAME
ADDRESS

Want the straight facts about a straight line drive?

More than ten years ago we introduced the Philadelphia MotoReduceR, a motorized, built-in drive employing the Planetary form of gearing. So successful have been the applications of this type of unit, that it clearly pointed to the need for **PHILADELPHIA PLANETARY SPEED REDUCERS** for those services where straight-line drives (separate from the motor) were desirable. Into these we put the same high grade parts and precision manufacture that made MotoReduceRs so widely acclaimed for their dependability and efficiency.

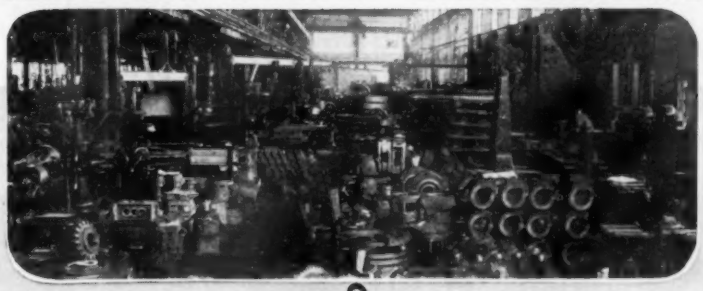
Philadelphia Planetary Reducers are available in single, compound and double reduction types in a variety of horsepowers and reduction ratios. The several methods of installation shown in the diagram here may suggest an application to you. If so, write today for our Planetary Speed Reducer Bulletin No. 100 that gives construction details, sizes and horsepower ratings.


ROLLER OR SILENT CHAIN DRIVE
REDUCTION MAY BE USED IN CHAIN TO INCREASE OVERALL RATIO.
MOTOR MOUNTED ON SAME LEVEL AS REDUCER ON COMPACT BASEPLATE.
DIRECT-CONNECTED FLEXIBLE COUPLING DRIVE.
MULTIPLE V-BELT DRIVE
MOTOR ABOVE GEAR DRIVE TO SAVE FLOOR SPACE.



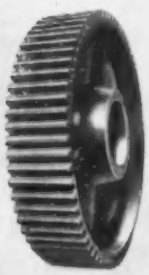
PHILADELPHIA GEAR WORKS

INDUSTRIAL GEARS
AND SPEED REDUCERS
LIMITORQUE VALVE CONTROLS



ERIE AVENUE & G STREET
PHILADELPHIA, PA.
New York, Pittsburgh, Chicago

Philadelphia
LIMITORQUE CONTROL
operates all types of valves, etc., safely, economically, from convenient stations.

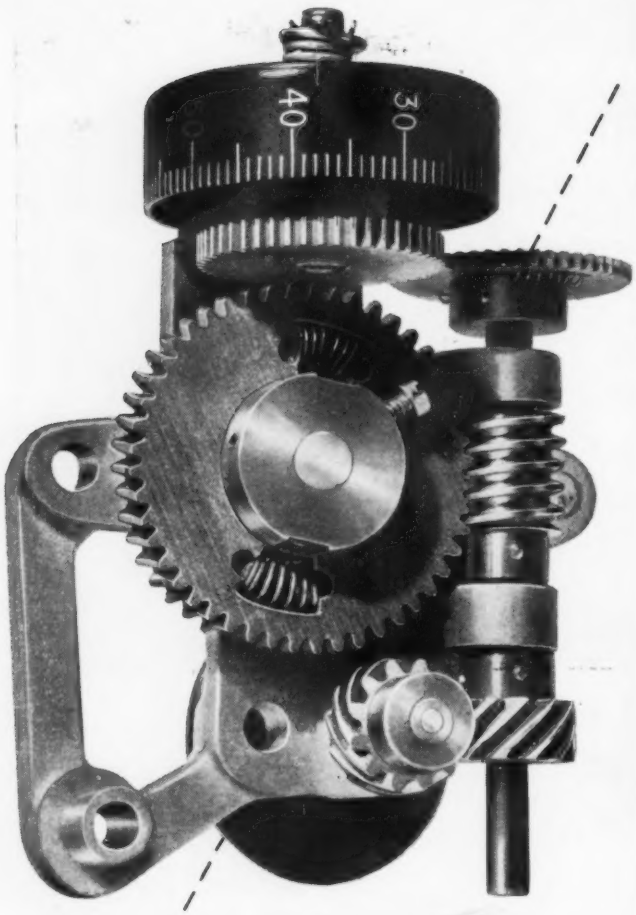


Philadelphia
GEARS
All types and sizes of industrial gears. Can be supplied in all materials.

Philadelphia
HERRINGBONE SPEED REDUCER
for heavy loads at high speed. Single, Double, Triple Reductions, various ratios and horsepowers.

Philadelphia MOTOREDUCER
The economical self-contained drive, Horizontal or Vertical types — various ratios and horsepowers.

Philadelphia
WORM GEAR SPEED REDUCER
right angle drives — vertical or horizontal. Wide range of ratios and horsepowers.



In base to plane communication one of the vital contributing factors toward the accuracy of pin point tuning is precision gears, and we are proud to say that QUAKER CITY GEARS are playing their part in assuring this accuracy.

Quaker City Gear Works
INCORPORATED

1910-32 NORTH FRONT STREET, PHILADELPHIA, PENNSYLVANIA

Gear Specialties

SPURS • HELICALS • BEVELS
(Straight & Spiral)
WORM GEARING • THREAD GRINDING
(14 to 96 D. P.)

This range logically embraces the gear components of many critical control devices essential to the war effort and this organization is proud of its contributions of such material in the program.

With full *production capacity* scheduled far into the future, all new inquiries are now necessarily subordinated to these vitally important prior commitments. However, every *urgent* need will be given careful consideration.

Gear Specialties
MANUFACTURERS
CHICAGO

2600 W. Medill Av. Ph. Hum. 3482

THE JOHNSON FRICTION CLUTCH

DOUBLE TYPE

IMPROVE POWER TRANSMISSION
with the **NEW "MAXITORQ"**
(MULTIPLE DISC) CLUTCH

This new JOHNSON design—the result of more than 40 years' specialization in the development of friction clutches—is particularly adapted to machine tool application because of its compactness, simple adjustment and easily controlled engagement. It can be assembled or disassembled without the use of tools. Floating plates minimize drag, abrasion or heating in neutral.

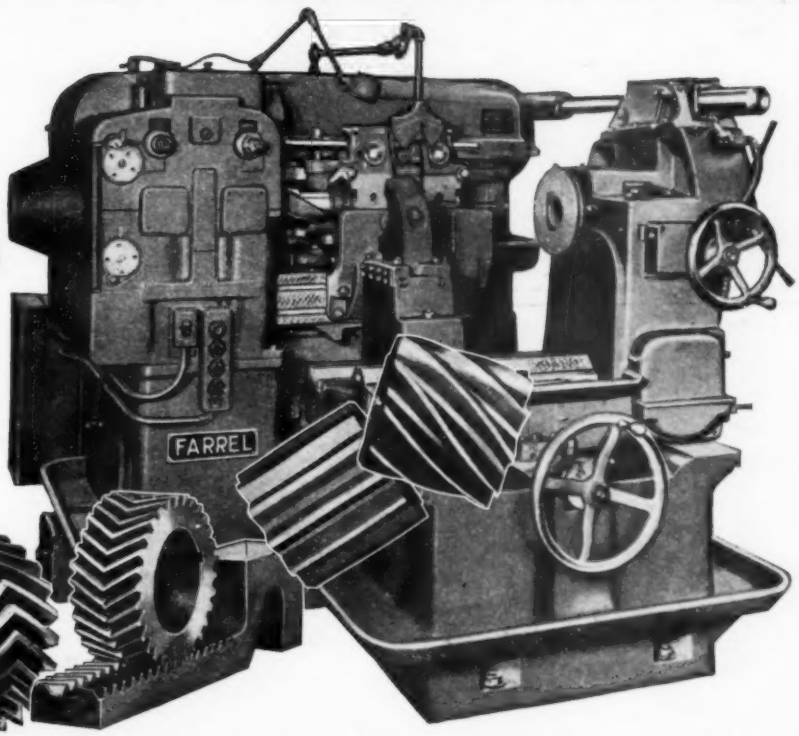
"MAXITORQ" FLOATING PLATE MULTIPLE DISC CLUTCHES are available in dry (self lubricated) and wet (running in oil) types in single, double and cut-off coupling types. Capacities range from ½ HP to 5 HP at 100 r.p.m. Send for detailed dimension sheets.

WRITE FOR MULTI DISC CLUTCH CATALOG NO. 45

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN

ANNOUNCING

A NEW 3-FOOT FARREL-SYKES GEAR GENERATOR



FOR CUTTING A WIDE VARIETY OF GEARS FROM 0 TO 37 INCHES IN DIAMETER

The line of Farrel-Sykes Gear Generators has been augmented by the addition of a new size – the 3-C machine. This new machine has been developed primarily to provide gear manufacturers who wish to produce a wide range of gear types in sizes up to 37 inches in diameter with a single gear generator for handling their output.

The 3-C machine, like other Farrel-Sykes Gear Generators, generates herringbone gears of all types, including the famous "Gear with a Backbone" . . . single helical and straight tooth (spur) gears with external or internal teeth . . . two members of a cluster gear simultaneously . . . racks (when the machine is equipped with a special fixture) . . . straight or tapered splined shafts . . . sprockets . . . cams . . . and many other toothed forms and special contours.

Farrel-Sykes Gear Generators cut gears with a speed, precision and economy that assure maximum output, continual accuracy of tooth contour and tooth spacing, and profitable operation. Their earning capacity is high, their performance trouble-free, their maintenance cost low.

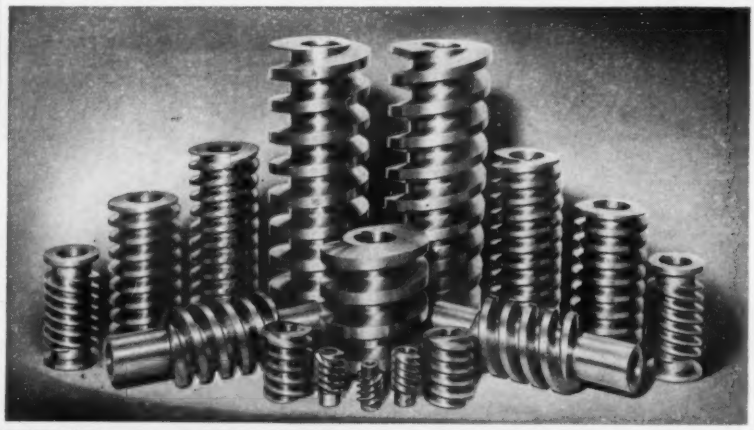
Besides the 3-C machine there are six other standard sizes of Farrel-Sykes Gear Generators for generating gears from the smallest practicable minimum up to 20 feet in diameter. We shall be glad to send you full information on any or all of these sizes. Just tell us what your requirements are.

CAPACITY OF 3-C MACHINE	
Diameter of Gear	0" to 37"
Face of Gear	
Double Helical	0" to 11"
Straight Tooth	0" to 6"
Diametral Pitches	
Helical	24DP to 3DP
Straight Tooth	24DP to 2½DP

FARREL-BIRMINGHAM COMPANY, INC.

Ansonia, Conn. FARREL **Buffalo, N. Y.**

THE GEAR WITH A BACKBONE

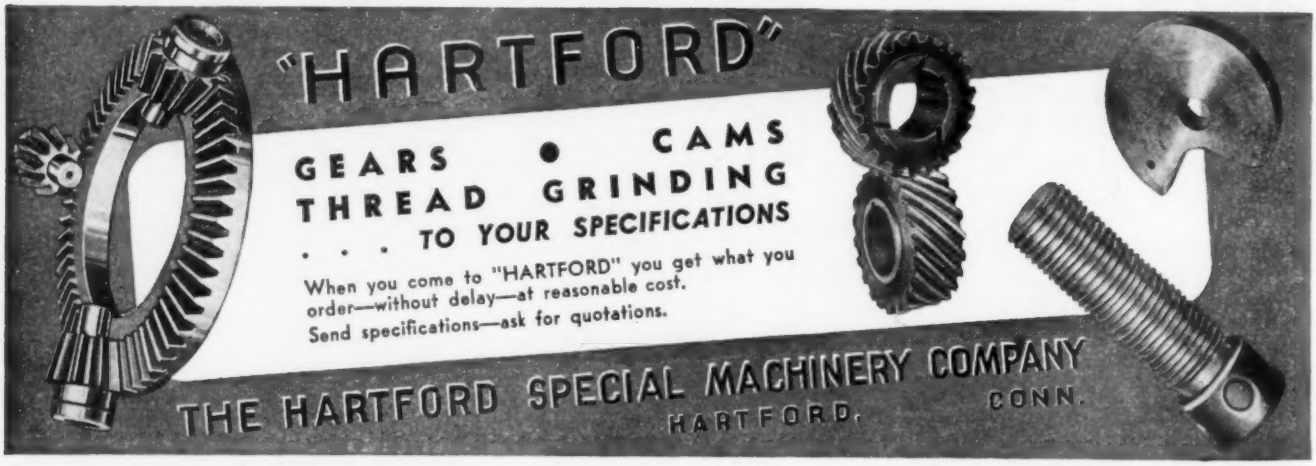


ADAMS GEARS

SPUR — HELICAL — WORM
BEVEL — MITER — RACKS

Splined Shafts A Specialty

THE ADAMS COMPANY
Est. 1883
1942 Bridge St. Dubuque, Iowa


"HARTFORD"
GEARS • CAMS
THREAD GRINDING
. . . TO YOUR SPECIFICATIONS
When you come to "HARTFORD" you get what you order—without delay—at reasonable cost.
Send specifications—ask for quotations.
THE HARTFORD SPECIAL MACHINERY COMPANY
HARTFORD, CONN.

Keep 'Em Running
AT TOP SPEED with
CINCINNATI GEARS
Give yourself every opportunity to "Keep 'Em Running". With production schedules being stepped up daily . . . Cincinnati Gears assume more and more importance to your plans. Get the "Right Gear for the Job" by using "Gears . . . Good Gears Only".
• HELICAL
• BEVEL
• SPUR
• SPLINE
• WORM
• SPECIAL
THE CINCINNATI GEAR COMPANY
"Gears . . . Good Gears Only"
Wooster Pike and Mariemont Ave. • Cincinnati, Ohio

GEAR CUTTING MACHINES

New Design
New Features
New Advantages

NEWARK GEAR CUTTING MACHINE CO.
69 Prospect Street, NEWARK, NEW JERSEY

SPECIALISTS . . .
not jacks of all trades!

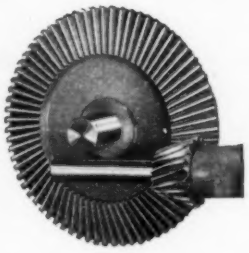
To do one thing *perfectly* rather than many things well is the sole objective of every MEISEL gear. And being constructed with only the requirements of a specific job in mind, MEISEL gears function at maximum efficiency always. Whatever your gear problem, investigate the advantages of *specifically* engineered gear by MEISEL.

MEISEL PRESS MFG. CO.
946 Dorchester Avenue Boston, Mass.

Gears in sizes from 2" to 52" diameter can now be produced in quantity and with SIER-BATH high precision quality to meet reasonably early delivery dates on high priority orders.

Our ability to quote good deliveries on gears for war equipment has been made possible by increasing our plant capacity through the addition of new modern, high-production gear-making machines. Ask us to quote prices and delivery on your specifications.

SIER-BATH GEAR CO.



BILGRAM QUALITY GEAR

ALL TYPES • ALL MATERIALS

BILGRAM GEAR & MACHINE WORKS

1217-35 Spring Garden, Philadelphia, Pa.

Facilities available for immediate production

BRAWNY GEARS

of fine pitch spur or internal gears, under 3" diameter. Fully machined blanks must be supplied by customer. Submit prints for prompt estimate.

BRAUN GEAR CO.

1590-1608 Atlantic Ave., Brooklyn, N. Y.

GANSCHOW GEARS

FOR SIXTY YEARS

Spur – SPEED REDUCERS – Worm

ALL TYPES OF CUT GEARS

GANSCHOW GEAR CO., 18 N. Morgan St., Chicago

GRANT GEARS

"64 YEARS" MANUFACTURING GEARS

Despite the continued growth of our gear business we are still in position to give each customer the attention they have a right to expect.

We carry a complete stock of standard cut gears and can furnish special gears to your specifications.

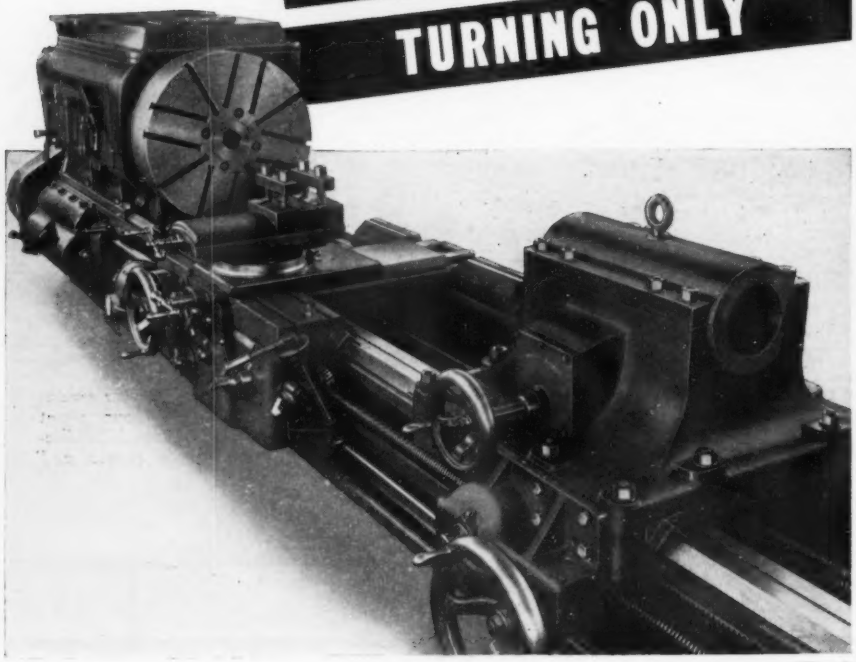
GRANT GEAR WORKS

BOSTON, MASS.

HEAVY-DUTY *Lathes*

FOR **BORING & TURNING**

TURNING ONLY



Sommerfeld LATHES

One of the newest machines in the Sommerfeld line is the 36-inch extra heavy-duty boring and turning lathe, illustrated above. This "Two-in-One" lathe bores and turns simultaneously, conserving floor space, labor, time and capital investment. For operations requiring turning only, it can be obtained without the boring equipment.

Other lathes in the Sommerfeld line include capacities from 27-inches to 60-inches inclusive, with beds of any length.

We will be glad to give you full details.

Sommerfeld
MACHINE COMPANY
BRADDOCK, PA.
Makers of Machine Tools since 1895

Still a few copies left of this valuable issue of

AMERICAN MACHINIST

• ***Please send order promptly to insure delivery***

ANNUAL BUYERS REFERENCE NUMBER

Special issue of Jan. 21, 1943 . . . price $1 postpaid

Biggest issue of the year! Invaluable as a guide to the new and improved machines, tools and equipment — describing almost 1,000 such items. Also a Where-to-Buy Directory listing suppliers of every conceivable metal-working need, with 600 reference headings. Also contains a valuable list of Sub-Contractors for Manufacturing or Services.

USE THIS HANDY COUPON

Circulation Department,
American Machinist,
330 West 42nd Street,
New York, N. Y.

Enclosed is ——— for which please send me:

—— copies of Jan. 21, 1943 Buyers Reference Number at $1.00 a copy

Name .....

Street Address .....

City .....

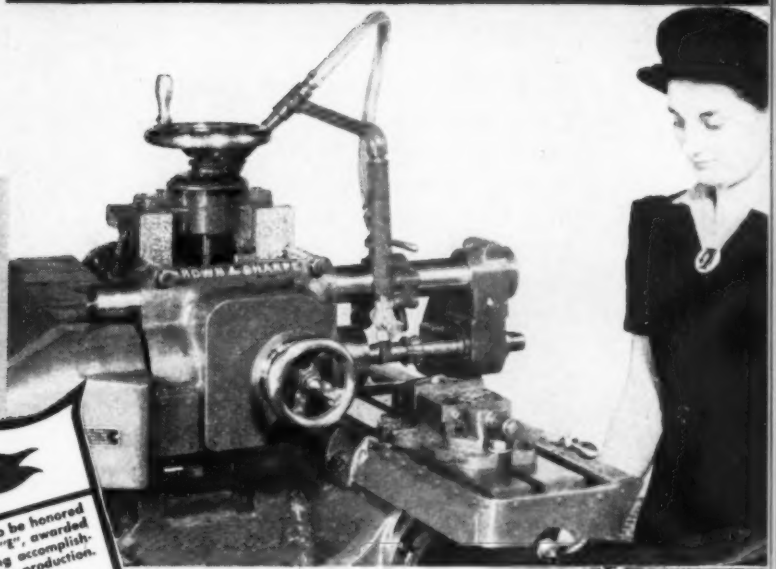
State .....

ALL Nº 000's FEATURES FIT INTO TODAY'S LIGHT MILLING REQUIREMENTS

EASY AND QUICK SET-UP

Easy Adjustment and Positioning — Transverse, vertical and table reversal
Easy Feed Changes — Pick-off gears
Easy Speed Changes — Pulleys and V-belt
Only One table dog to set

SIMPLE AND RAPID OPERATION



Automatic Cycle — Simply load . . . press starting button . . . await return of table to loading position
Rigidity for reasonable cutting rates
Suitable speeds and feeds for ferrous and non-ferrous materials

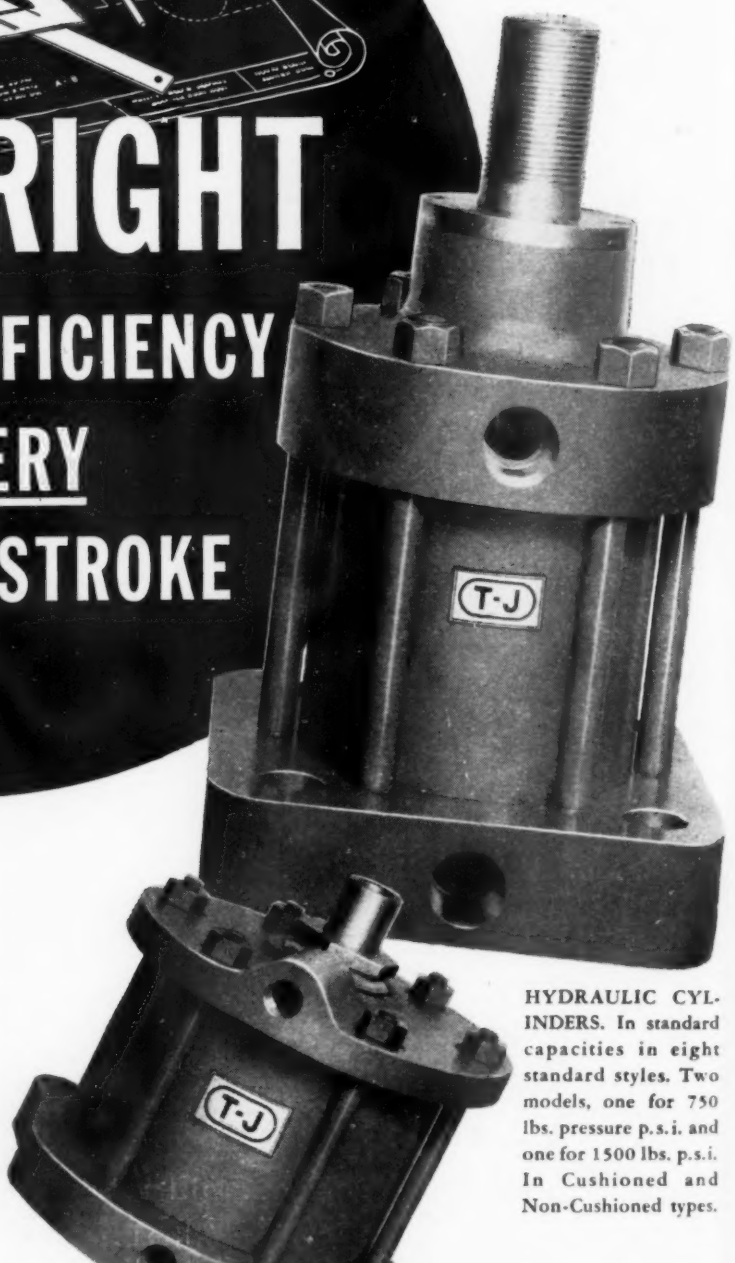
DELIVERIES ARE GOOD
on New No. 000 Plain Milling Machines

We are proud to be honored with the Navy "E", awarded for outstanding accomplishment in Defense production.
Brown & Sharpe Mfg. Co.
Providence, R. I., U. S. A.

BROWN & SHARPE

BUILT RIGHT

FOR TOP EFFICIENCY IN EVERY CYLINDER STROKE



T-J AIR AND HYDRAULIC CYLINDERS are *accurately machined* to assure *right* mounting and highly efficient performance. The mounting surfaces are parallel with (or at right angles to) the bore of the cylinder. All surfaces are strictly inspected for squareness and smoothness. All mounting holes are drilled—not just cored. T-J engineering and experienced workmanship assure *maximum power movement*...long dependability. Write for latest catalogs on T-J Cylinders. The Tomkins-Johnson Co., Jackson, Mich.

HYDRAULIC CYLINDERS. In standard capacities in eight standard styles. Two models, one for 750 lbs. pressure p.s.i. and one for 1500 lbs. p.s.i. In Cushioned and Non-Cushioned types.

AIR CYLINDERS. In all standard sizes and in seven standard styles. Cushioned and Non-Cushioned types.

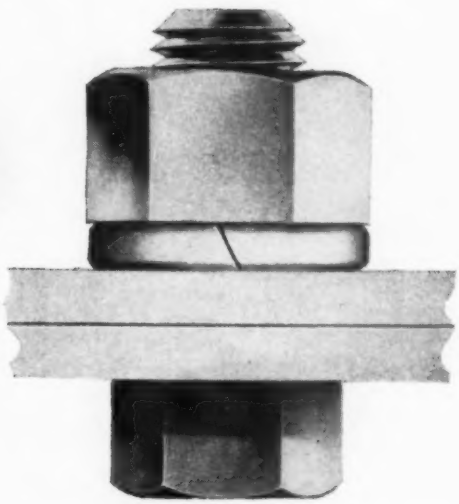
FOR TOUGH JOBS...SPECIFY T-J

TOMKINS-JOHNSON

RIVITORS...AIR AND HYDRAULIC CYLINDERS...CUTTERS...CLINCHORS

When we say "spring"...

WE MEAN



Tight—a nut wrenched home sets up great pressure on threads and between all parts.

No other device has the power and the long range of live spring action given you by a Kantlink Spring Washer.

There is no substitute as economical. The short-range multi-toothed washers that bite in can not possibly equal Kantlink's range of spring power.

And the only claim for a fixed nut is that it can't turn on a bolt. Nuts rarely ever turn backward on bolts – they can't turn while there is any pressure at all on the threads of the nut and its bolt. But the **other** parts of almost every vibrating bolted construction wear loose inevitably, **unless** held fast by a strong compensating spring.

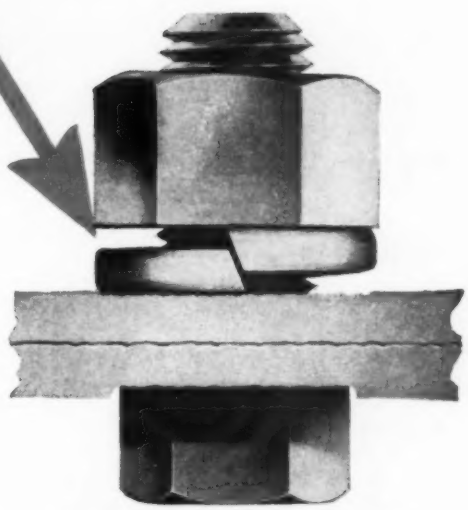
The parts wear loose because of bolt stretch and frictional wear of metal on metal, burrs and flares, and because of pulverizing of paint, scale and rust.

Kantlinks are being used with millions of nuts, bolts and screws of all types. They keep expanding to hold all parts **tight** despite inevitable wear.

In ordering spring washers – specify **Kantlink,** the big long range live spring washer.

Let us send you samples, – send details of your application. Test and compare them on the same job with **any** type of nut, or with any other type of washer. Kantlinks can't lose a real test. Try them for efficiency, economy and real safety.

Write today for descriptive folder.



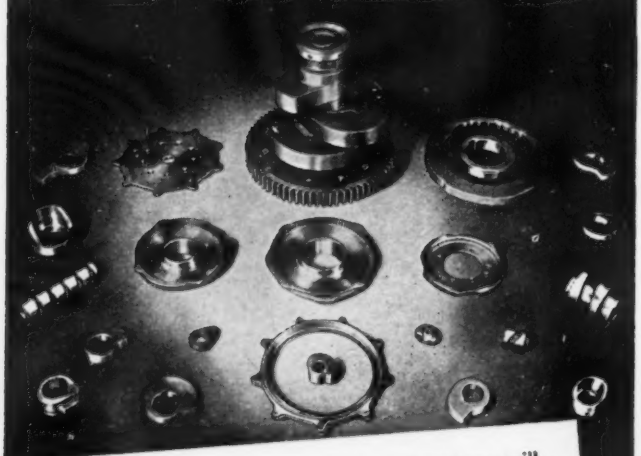
Still tight. Though the nut never turned, the other parts wore and stretched. The assembly would have loosened except for the wide range of spring power of a—

KANTLINK TRADE MARK

the long-range Spring Washer

THE NATIONAL LOCK WASHER COMPANY
NEWARK, N. J., U. S. A.

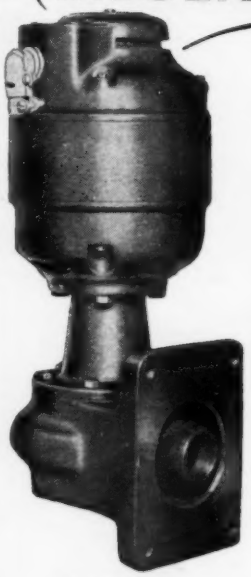
CAMS



LET the largest, most completely equipped cam milling plant in the mid-west handle your cam problems. All sizes of drum, face, groove or other styles of cams cut to order in quantities of one or one thousand. Send specifications or blueprints for a quotation on your requirements.

KUX MACHINE COMPANY
3930-44 W. HARRISON, ST. CHICAGO, ILL.

SIMPLE INSTALLATION



Model 11020-A
Internal Discharge Type

Internal Discharge Thru Center of Intake Eliminates outside piping.

RUTHMAN
GUSHER
COOLANT PUMPS

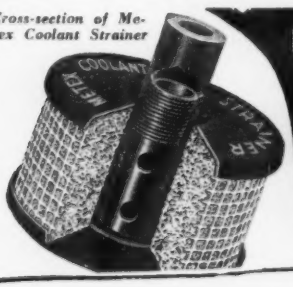
Because they are simple in design Gusher Coolant Pumps are trouble-free . . . efficient . . . dependable. They offer you *exclusive and patented* advantages. Suited for today's high speed production. From 1/30 to 2 H.P.

There's a Gusher to meet your needs in our line of immersed, pipe-connected, flange-mounted, plain drive and tank unit types of coolant pumps.

Specify Gusher. Write for data.

THE RUTHMAN MACHINERY CO.
1809 Reading Road Cincinnati, Ohio
Largest Exclusive Builders of Coolant Pumps

Cross-section of Metex Coolant Strainer



NOW YOU CAN KEEP
PRODUCTION WHEELS HUMMING...

24 Hours a Day—Week after Week

On all metal cutting machinery using a coolant flow

New Coolant Strainer Saves Production interruptions — Labor Costs — Damage to pump by metal cuttings.

Incessant pump cleaning, and shut-downs for replacing damaged gears, are now eliminated by installing a Metex Coolant Strainer*. This strainer, constructed of interstitially knitted and crimped mesh, excludes minutest particles of metal. Even on "dirty work" the Metex Coolant Strainers filters effectively for approximately a month, 24 hours a day. A new refill can then be installed in a minute. Metex Coolant Strainer saves your pump—saves your coolant—saves *valuable hours of production.*

METAL TEXTILE CORPORATION
Dept. (AM-4), 4 Central Ave. Orange, New Jersey

*Reg. U. S. Pat. Off.

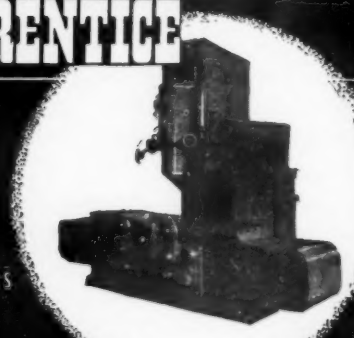
UNSHAKO
Reg. U. S. Pat. Off.

SELF-LOCKING NUT HOLDS TIGHT

Patd. & Pats. Pends. Cut-away section showing locking ring in place.

STANDARD PRESSED STEEL CO.
BOX 4 JENKINTOWN PENNA.

REED-PRENTICE



LATHES
JIG BORERS
DIE SINKERS
DIE CASTERS
VERTICAL MILLERS
INJECTION MOLDERS

REED-PRENTICE CORP.
WORCESTER MASS. U.S.A.

A WAR PRODUCTION MACHINE WITH AN EYE TO THE FUTURE

No doubt you are making fighting materials for America now — but when peace comes you'll go back to peace production! The Smallpeice Production Lathe spells equal success for war *or* peace manufacturing! It's the ideal production machine for every type of regular turning, boring facing, and profiling — with versatility that means a *real* investment.

Smallpeice is quick — efficient — essential, and is Napoleonic in size as well as accomplishment, for it occupies only a small portion of your floor space! *Little giant* action gets results. Unit design with provisions for a wide range and variety of slides, overarms, and similar attachments for work up to 58" between centers, and 18" swing, means that your Smallpeice Production Lathe is rapidly converted into a special purpose automatic!

Let our engineers assist you in solving your problem.

Write for detailed information

ELLWOOD L. HOUTZ, AGENT, 93 HALE STREET, BEVERLY, MASSACHUSETTS

Smallpeice Ltd., Great Britain

"SMALLPEICE"—MACHINE TOOLS AND EQUIPMENT MANUFACTURED IN U.S.A. AND GREAT BRITAIN

NORTON ABRASIVES

HAVE YOU MET THESE "GADGETS" OF METALITE CLOTH?

They're the Kind of Friends That Save You Money

It seems as if we never stop adding new, ingenious, time-saving abrasive "gadgets" to the long list already available.

You simply mustn't take it for granted that you have the last word in efficient, economical sanding and finishing unless you check frequently with one of our product engineers. For they are in constant counsel with our experimental and manufacturing departments and in daily contact with the latest operations in plants all over the country.

It is so easy to get in touch with our nearest office and learn promptly through one of these experienced engineers the very newest mechanical sanding method for any job on metal, wood or plastics. We're anxious to help all we can; that's why we have these branches.

Boston, Buffalo, Chicago, Cincinnati, Cleveland, Detroit, Grand Rapids, High Point, Indianapolis, Los Angeles, New York, Philadelphia, St. Louis, San Francisco, Tacoma.

Dependable Abrasives Since 1872

BEHR-MANNING
(DIVISION OF NORTON COMPANY)
TROY, N. Y.

They rely on the efficiency of their equipment

THE NATIONAL STANDARD
FOR WAR PRODUCTION

THE JACOBS MANUFACTURING CO.
HARTFORD, CONN.

. . . . *you* rely on the perfection of

JACOBS CHUCKS

O.W.I. Photo

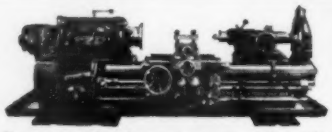
His first "day off"

Johnny Doughboy was employed by a large organization, the United States Government. He was a machine operator and his particular work was to feed a machine which pumped lead at high velocity. His hours of work were long but he never received overtime wages. Johnny felt himself highly paid because he knew he was important and that his efforts would enrich and insure the future of his wife and family. Because his employer had undertaken a very large order abroad and could not spare other men away from their machines, Johnny had been on the job for weeks and months. Unfortunately, through the carelessness of other employees who did not supply him with enough proper equipment, Johnny had an accident—which forced him to take his first day off.

* * * *

There are many other "Johnnies" who operate machines—at home. They're working for the same outfit but their hours are much, much shorter and their tasks not quite so hazardous. Some of them take days off, for pleasure—not because they are forced to. Those absentee days mean that more Johnny Doughboys will be forced to take days off—but *permanently*.

* * * *



Concentrated, time-saving controls, 24-speed headstock, unit mounted constant speed motor, 2 speed tailstock spindle give you top production in Axelson Lathes. Before you buy any lathe, investigate the Axelson line which includes 14, 16, 18, 20, 25, and 32-inch sizes in varying lengths.

Here at the Axelson Manufacturing Company, the men and women who are important in the making of lathes that turn for victory, know that each day of absenteeism may prove fatal to some son, brother, father—perhaps their own. That's why days off at Axelson are down to a minimum—and production of machine tools is at an ever-rising maximum.

We're working night and day to keep Johnny Doughboy on the job so he won't be forced to take "days off".

* * * *

AXELSON MANUFACTURING COMPANY

6160 South Boyle Ave., Los Angeles, Calif.
(P. O. Box 98, Vernon Station)
50 Church Street, New York City, N. Y.
3844 Walsh Street, St. Louis, Missouri

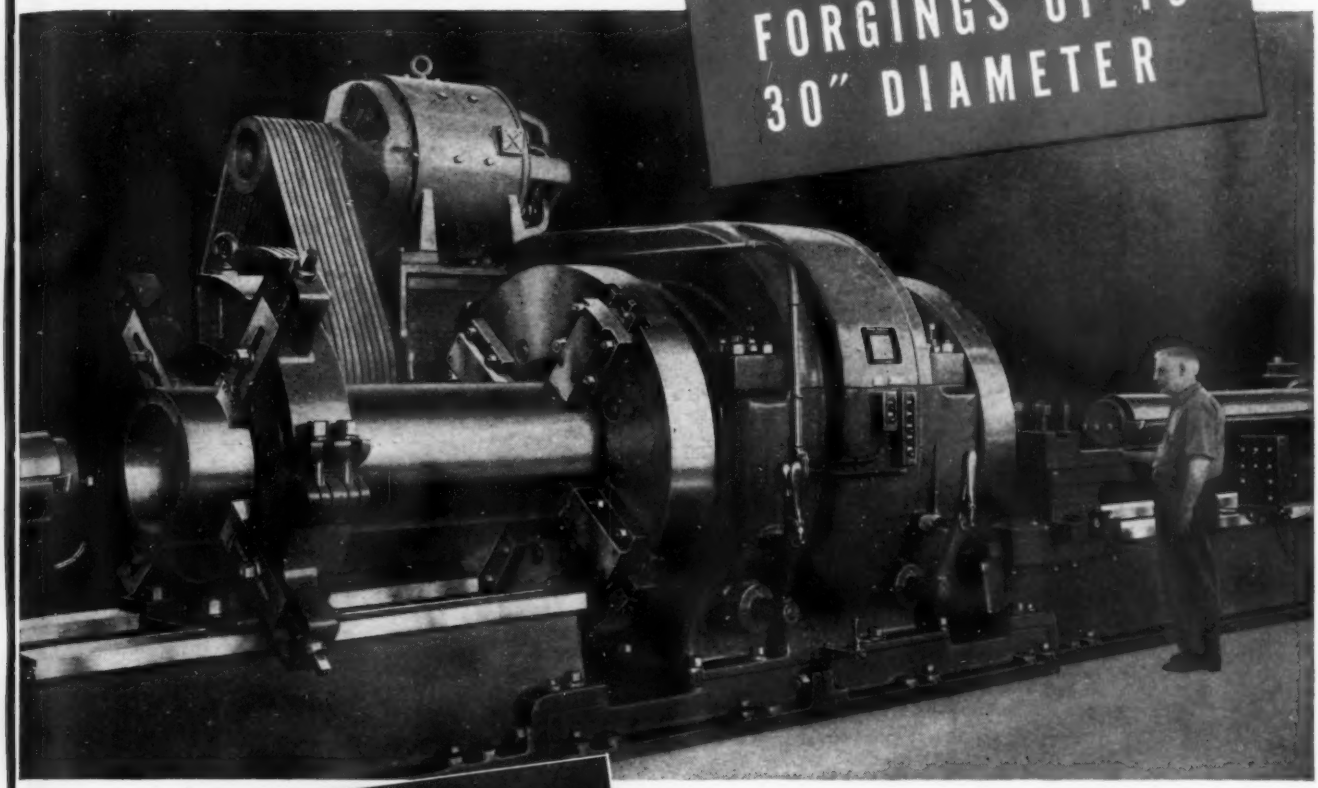
AXELSON LATHES

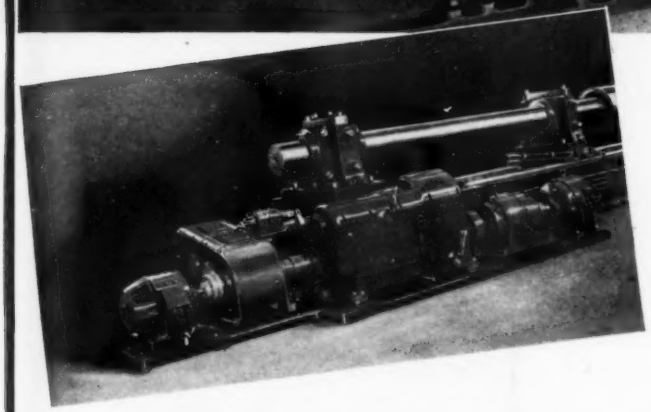
ARMY NAVY

THERE IS NO ECONOMICAL SUBSTITUTE FOR QUALITY

DEPENDABLE FOR OVER A QUARTER CENTURY

FOR BORING EXTRA-HEAVY HOLLOW FORGINGS UP TO 30" DIAMETER





WICKES DOUBLE-END BORING LATHE

In this big Wickes 30" Double-End Boring Lathe you have the last word in a tool for boring large forgings. Such products as torpedo airflasks and large guns are today being efficiently bored by this lathe. Capacity is up to 30" diameter and up to any length desired. Range of spindle speeds is ¾ to 29 RPM. Range of feeds is 2½" to 45" per hour. Each end of the lathe is equipped with a separate feed driven by a variable speed DC motor with rapid power traverse.

Any length bed is available for either end of the machine and any length and diameter of boring bar may be had. A portable push button station for each end of the lathe gives the operator instantaneous control over the main drive, feed and rapid traverse. A spotting carriage with compound rest is provided for preliminary work on the end of the forging.

For further facts and prices write today for Bulletin DB-10.

Wickes Lathes CUT COSTS • SPEED PRODUCTION

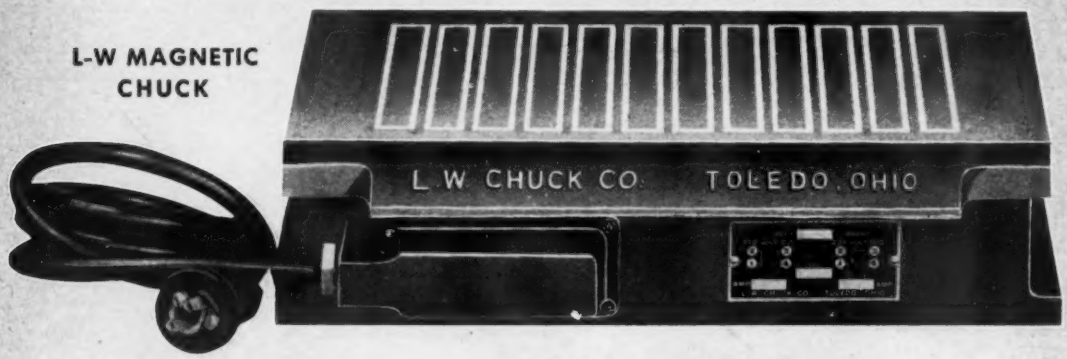
WICKES BROTHERS • SAGINAW, MICHIGAN • EST. 1854

Crankshaft Turning Equipment • Double-End Boring, Heavy Duty Engine, and Special Production Lathes • Simplex Blue Printers

MAGNETIC CHUCKS

. . . guaranteed maximum magnetic holding power, constructed for long life, water-proof for wet or dry grinding. These features plus scientific design and highest grade materials are your assurance that L-W Magnetic Chucks will properly fill all requirements . . . meet any demands. L-W Magnetic Chucks are built in four sizes, supplied with connections to operate on either 110 or 220 volt D. C.

L-W MAGNETIC CHUCK



L-W

RECTIFIER, converts A. C. into D. C., for use on magnetic chucks. A. C. input 110 volts. D. C. output 110 volts, 8 amps. Suitable for use with our 5¾ x 13 and 6½ x 18 magnetic chucks . . . Price **$25.00.** Larger capacity rectifiers available.

MAGNETIC CHUCKS

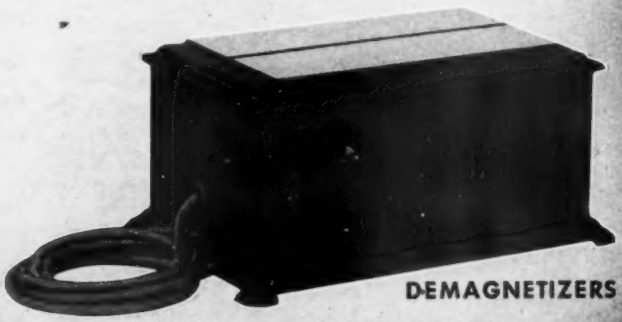
Working Surface 10¾" wide, 37" long	$202.05
Working Surface 8" wide, 24" long . .	109.30
Working Surface 6½" wide, 18" long .	63.15
Working Surface 5¾" wide, 13" long .	47.65

DEMAGNETIZERS

Model B-2 working surface 7¾" x 12½" x 6¾" . .	$63.20
Model J-1 working surface 7¼" x 7¼" x 6¾" . .	41.15

DEMAGNETIZING SWITCHES

Field Discharge Type	$16.25
L-W Demagnetizing Switch	8.90



DEMAGNETIZERS

A new catalogue is available . . . send for your free copy today!

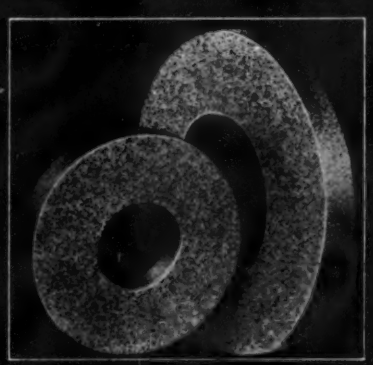
L-W CHUCK COMPANY

1-7 N. ST. CLAIR ST.
TOLEDO, OHIO

Also manufacturers of LATHE CHUCKS • DIVIDING HEADS • MILLING MACHINE VISES • POWER HACK SAWS

The "Wheels of Industry" are also the Wheels of War

THE grinding wheel worker's importance in today's industrial war effort makes him a symbol of all America's determination to turn out faster the better material needed for quick victory. Although far from the battle lines, he stands first on the home production front. His work is among the most needed functions that keep today's industrial fabrication on the move. Without grinding wheels, few planes, guns, tanks or ships could be produced. Laborious hand finishing would replace swift grinding operations . . close tolerances would be impossible. Thanks to his patriotic zeal, the grinding wheel worker is turning out more than ever before. You can count on him to come through!

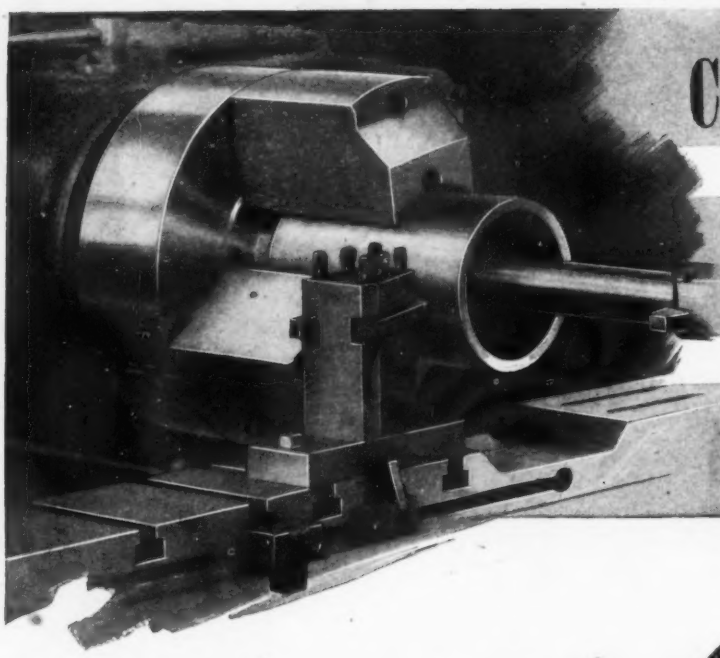


Sterling Grinding Wheels are being produced faster in all shapes and sizes for better-than-ever results. The number of available "Wheels of Industry" is being constantly increased to keep pace with your needs. Do you need help - - quickly? Place your confidence in a Sterling engineer . . he is available for immediate conference. Write!

• STERLING ABRASIVES •

THE
STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO

THE WHEELS OF INDUSTRY



choose 'em right
use 'em right
treat 'em right

that's the way to get production out of Chucks

By the thousands, Cushman Chucks are serving America's war production lines and those of our allies. As in any army, there are "casualties" among these chucks. And just as the army works constantly to reduce the number and seriousness of casualties, so we urge you to promote good chuck practices and maintenance that will reduce machine shut-down and chuck replacements...so that production may be increased.

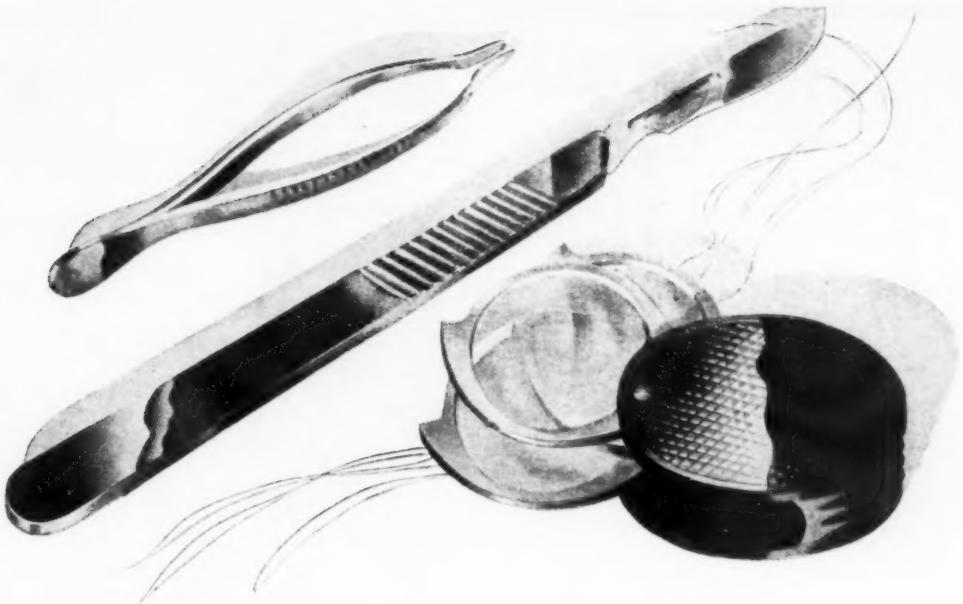
"Choose 'em right, use 'em right and treat 'em right" is a good slogan. See that the men who order chucks have a copy of the Cushman Catalog and Data Book. See that chucks of correct size and capacity are used for the work to be done. See that operators have copies of Cushman "Chuck Check" cards that give the six fundamentals of good usage and maintenance.

We will be glad to send you this material. We are anxious to help in every way we can. The Cushman Chuck Co., Hartford, Connecticut.

These small cards can be given to operators or put on bulletin boards. They'll help save time, save chucks and reduce spoilage.

CUSHMAN

A World Standard for PRECISION



When Hair-Splitting is Crude Work

Split-hair accuracy isn't close enough for today's production. Tools have to be specifically *designed and built* to hold the work to the invisible tolerances now required on many parts. And that's a **HECKER** specialty.

Frequently the character of the tool, jig or fixture is the difference between precision work at normal speed (or less) and the same precision work on stepped-up production cycles.

HECKER tool engineers are serving a wide range of industries, whose names read like an industrial Blue Book. This accumulated experience with men and machines of all types is ready to tackle your tooling problems.

Furthermore, these engineers are in close contact with the **HECKER** production of precision parts for leading aircraft manufacturers. They know at firsthand how their tool designs are performing.

Give us a real tooling problem to solve for you. Discuss it, no strings attached, with one of the **HECKER** field engineers. Write to A. W. Hecker, 1982 East 66th Street, Cleveland, Ohio; or, 517 New Center Building, Detroit, Michigan.

A★W★ Hecker

DESIGNERS AND BUILDERS OF TOOLS, JIGS AND FIXTURES . . . FABRICATORS OF AIRCRAFT PARTS

"Blount" MODEL B-2 LATHE

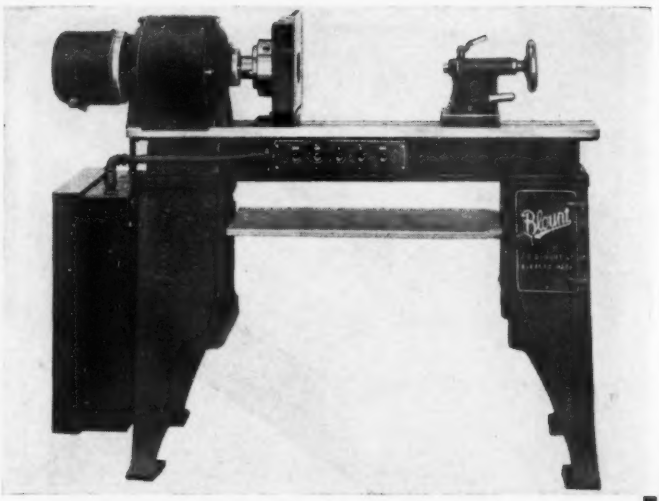
. . . offering modern features for quick, easy control . . .

This highly developed machine provides every convenience which modern design can offer to make it highly productive with a minimum of effort on the part of the operator.

A Ball-Bearing Motor Type Headstock is used and is equipped with the very latest type selective speed pushbutton control, including magnetic contact panel. An automatic electric solenoid brake is provided for quick stopping and includes also a manual spindle release.

Lathes of similar type are generally furnished with four-speed drum controller, mounted on inside of leg (outside optional) also with reversing switch, and may include solenoid brake as Lathe B-2 together with chuck guard.

Standard equipment of Lathe Model B-2 includes "chuck guard" as well as six adapter plates or slides having various hold diameters to suit conditions.



CONDENSED SPECIFICATIONS

Swing—12", Bed—4'
4 Speeds—600-1200-1800-3600 R.P.M.
(also furnished for 300-600-900-1800 R.P.M.)
H.P.—½

Also furnished as follows:
Swing—16" and 18", Bed Lengths—optional
4 speeds—300-450-600-900 R.P.M.
H.P.—¾

Complete details available promptly on request

J. G. BLOUNT COMPANY *Everett, Mass., U.S.A.*

SIMMONS 120" x 96" HEAVY DUTY PLANER

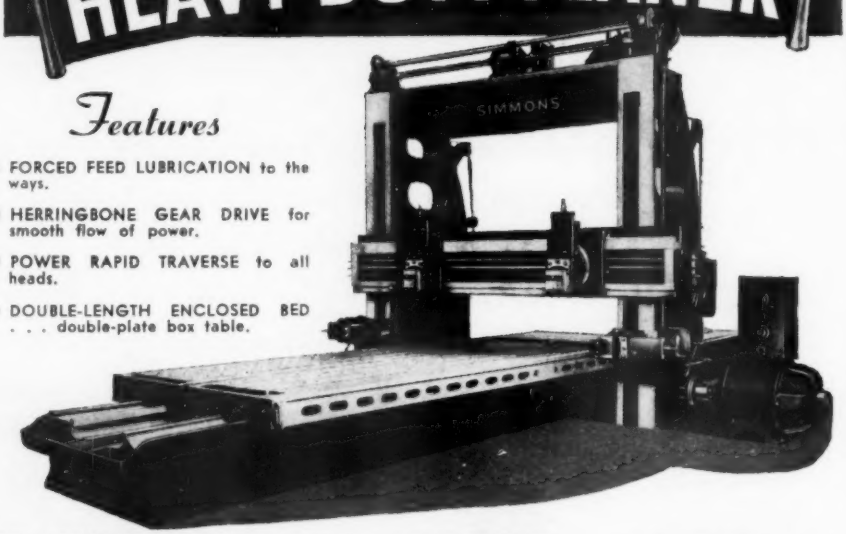
Simmons 120" x 96" Heavy Duty Planer is designed for efficiency and economy of operation. Power Rapid Traverse to all heads operates through specially designed clutches. Double length enclosed bed is equipped with forced feed lubrication to the ways. Inner guide box table has one flat and one vee way, riding constantly in a film of oil. Bottom side of table entirely closed. Heavy ribs tie top and bottom securely.

Sykes herringbone gears are used in all drive shafts up to bullgear and pinion which have spur teeth to mesh with table rack.

Electrical equipment includes constant potential reversing motor drive with 50 H.P. D.C. 230-v. 150-900 R.P.M. motor control. Table Speeds 19 to 115 feet per minute. Write TODAY for bulletin giving complete details.

Features

- FORCED FEED LUBRICATION to the ways.
- HERRINGBONE GEAR DRIVE for smooth flow of power.
- POWER RAPID TRAVERSE to all heads.
- DOUBLE-LENGTH ENCLOSED BED . . . double-plate box table.



SIMMONS MACHINE TOOL CORP.

Main Office: 1759 NORTH BROADWAY, ALBANY, N. Y. *New York Office:* 149 BROADWAY

SIMMONS

LATHES · TURRET LATHES · MILLERS · PLANERS · 6" BAR BORING MACHINES

THE PRODUCTION ARMY NEEDS HARD-HITTING SMALL ARMS, TOO

When you're shooting for big production gains, make sure the "small arms" you are using — the cutting tools — are accurate, efficient, dependable!

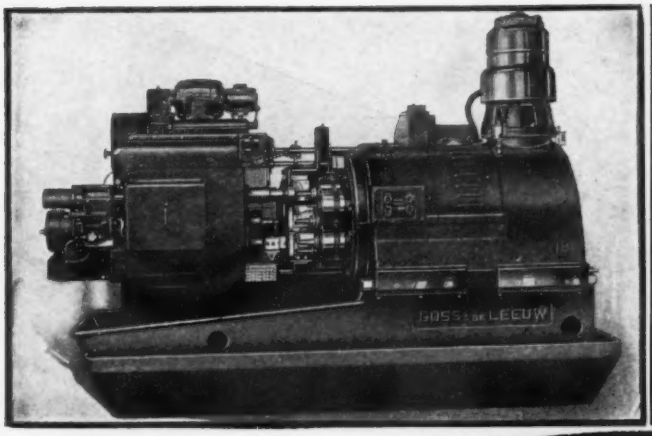
MORSE

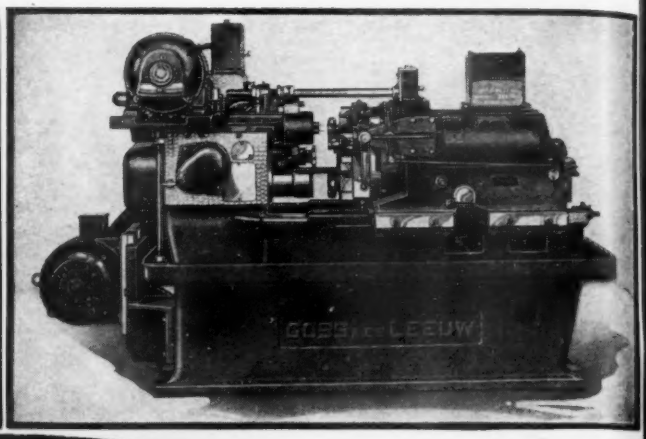
THERE IS A DIFFERENCE

TWIST DRILL AND MACHINE COMPANY

NEW BEDFORD, MASS., U. S. A.

NEW YORK STORE: 130 LAFAYETTE ST. - - - - CHICAGO STORE: 570 WEST RANDOLPH ST.





WORK ROTATING TYPE

5 Spindles
6 Spindles
8 Spindles

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES

TOOL ROTATING TYPE

4 Spindles
5 Chucking Positions

On these machines, two threading operations can be handled simultaneously, each thread controlled by its own lead screw.

Among the many other modern features offered in both types are: pre-loaded anti-friction spindle bearings, hardened ways, oversize spindles and gears of chrome-nickel steel, heat-treated.

Complete details will be found in descriptive catalog available on request.

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

Abbott Bearing Balls, in your assemblies, will safeguard your Standards of Precision and help to assure the dependability expected of your products.

STAMINA is Vital

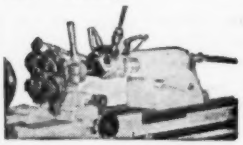
DELIVERY ESTIMATES PROMPTLY GIVEN

ROLL ON **ABBOTT** *Bearing* **BALLS**

THE ABBOTT BALL COMPANY HARTFORD, CONN. U.S.A.

DON'T WAIT FOR TURRET LATHES

Convert any engine lathe into a turret lathe in 15 seconds with JEFFERSON TURRET ATTACHMENTS. To fit bench lathes and lathes up to 24" swing



● This new modern TOOL-POST TURRET (below, right), made in 2 sizes, designed to increase production on engine lathes. Easily mounted on cross slide or compound rest. Has capacity of 4 standard tool holders which are easily inserted and rigidly held.

6 Days Delivery

Pat. Pending

4-Tool Tool-Post Turret

● Then there's the completely modernized 5-tool TAIL-STOCK TURRET (below right), made in 4 sizes to fit small bench lathes and lathes up to 24" swing. Also the adjustable PULL-FEED LEVER. Jefferson Turrets are real production tools—substantial, rigid, accurate. They must not be confused with the small make-shift gadgets now on the market.

The Jefferson Bull-Dog Precision Milling Machine. Obtainable Power or Hand Feed.

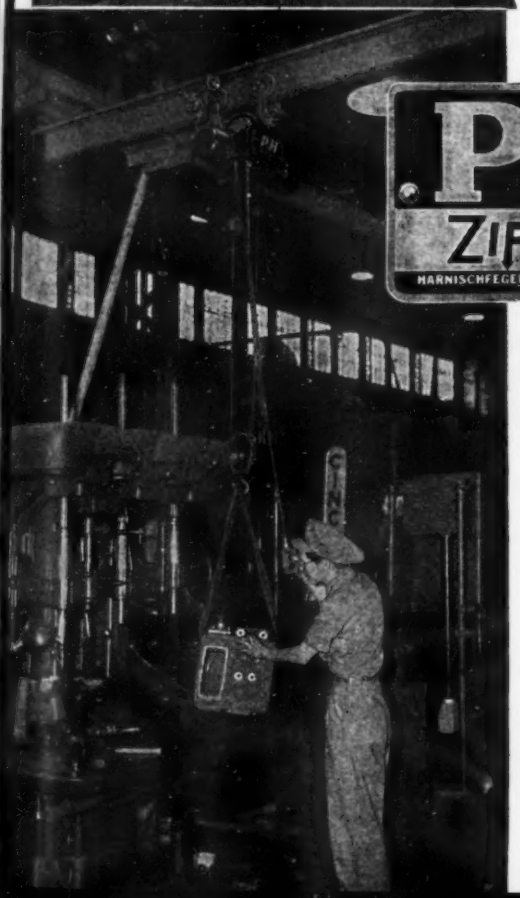
5-Tool Tail-Stock Turret

Pat. Pending

● **ALSO—*Milling Machine Dividing Heads, Vises, Belt Sanders, Swing Frame Grinders, Gyratory Foundry Riddles.***

JEFFERSON MACHINE TOOL CO.

SO. SWEENEY, CUTTER & FOURTH STS. CINCINNATI, OHIO



Available in capacities of 250, 500, 1000 and 2000 lbs.

"This idea appeals to me — bossing things around by push-buttons! Come on, heavyweight, get going!"

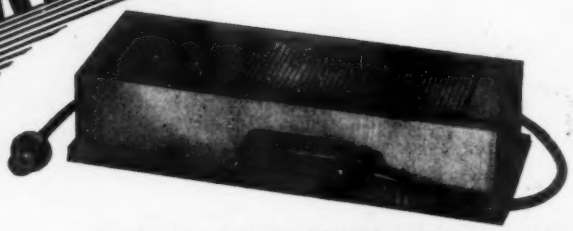
Right you are, Miss War Winner! And give your boss credit for knowing a thing or two. He knows that war production calls for speed — that electrical energy is faster, costs less than human energy. He knows how much time it saves you — how much effort and fatigue you're spared. That's important in war production; and in peacetime, too. That's why your boss provides Zip-Lifts — to make things easier for you. They're simple to operate; easy to mount on hook, jib, or trolley; and they plug into any standard lighting circuit. The Zip-Lift is the only small hoist with this full magnetic push-button control.

General Offices: 4514 West National Avenue, Milwaukee, Wis.

HARNISCHFEGER
CORPORATION
HOISTS • WELDING ELECTRODES • MOTORS P&H EXCAVATORS • ELECTRIC CRANES • ARC WELDERS

WALKER MAGNETIC CHUCKS

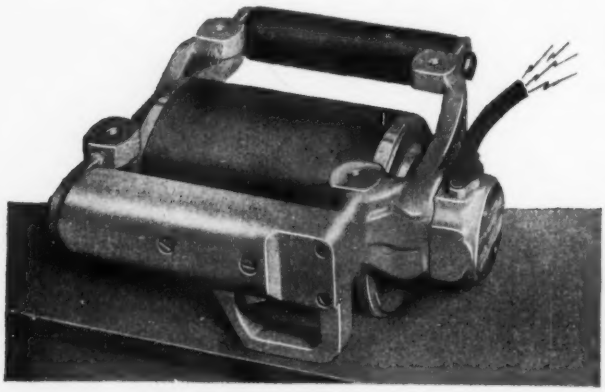
Style B Face Plate—in standard diameters from 10⅜" to 36⅜" inclusive.



No. 617 Bar Pole Face Rectangular Magnetic Chuck.

DEMAGNETIZERS

Walker DEMAGNETIZERS are available in standard D.C. and A.C. types for either 110 or 220 v. Ask for Bulletin K7 giving detailed specifications.



A FULL LINE OF PROVED STANDARD DESIGNS

Walker offers prompt and complete service on magnetic chucks by carrying in stock a considerable line of Rectangular and Rotary types for use on all surface and internal grinding machines built by American machine tool manufacturers. These units—for grinding, milling, planing and turning operations—are of proved design and are available in such a complete range of sizes as to enable you to select standard units for practically any chucking problem. Write for bulletin W4 giving detailed information.

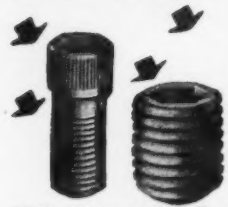
Also special CHUCKS *for special* NEEDS

The design of Walker Magnetic Chucks is such that "specials" can be developed and furnished at prices only slightly more than standard units. If you require special magnetic chucks for special purposes, consult Walker and be assured of prompt, economical service.

O. S. WALKER CO., INC.

WORCESTER, MASS.

DANLY *Knurled*



All Die Makers' Supplies
Danly Commercial Sets
Danly Special Sets

SOCKET-HEAD CAP SCREWS
HOLLOW SET SCREWS

DANLY MACHINE SPECIALTIES, INC.
2100 South 52nd Avenue, Chicago, Illinois
MILWAUKEE • LONG ISLAND CITY, N. Y.
DAYTON • DETROIT • ROCHESTER
CLEVELAND • PHILADELPHIA
DUCOMMUN METALS & SUPPLY CO.
Los Angeles • San Francisco

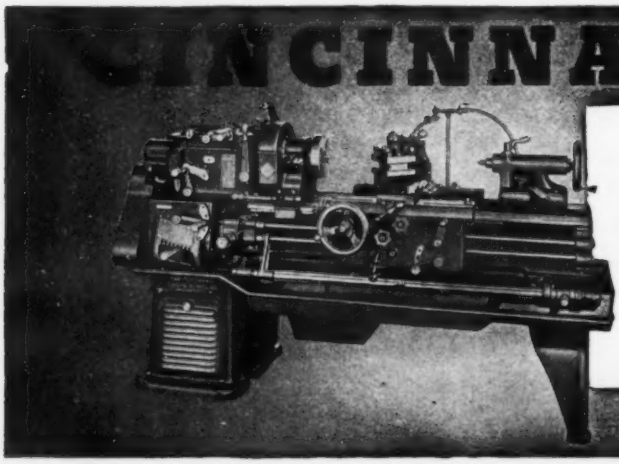
DANLY PRECISION DIE SETS

HIGH SPEED CENTERS.

WILL OUTWEAR 10
CARBON STEEL CENTERS
because . . .

Red E Centers
Have High Speed Steel Points

The Ready Tool Company
Iranistan & Railroad Aves.
Bridgeport, Conn.



CINCINNATI LATHES
Accurate in Every Detail

Gears—precision cut, tempered and ground . . . Spindle—mounted on Roller Bearings to resist any combination of thrusts . . . Bed—extra heavy in construction . . . Ways and carriage hand scraped to a precision bearing. These features of Cincinnati Lathes add up to accuracy in every detail that insures precision results on every job. Write for compiete specifications on 14" to 30" sizes to produce your work always most economically.

THE CINCINNATI LATHE & TOOL CO.

Rogers Road, Oakley SPECIALISTS SINCE 1906 Cincinnati, Ohio

STELLITE HIGH-PRODUCTION CUTTING TOOLS
are Available for Prompt Delivery

Stellite "98M2" and "Star-J-Metal" tools are widely used for machining steel, cast iron, and most of the machinable materials. These dependable tools take heavy cuts at high speeds and heavy feeds—with long life between grinds. This means high production at low cost per piece machined.

The types and sizes in which each grade is available, the purposes for which each type is recommended, and the correct grinding wheels to use are shown in the descriptive price lists illustrated below. Copies of any of these price lists will be sent on request.

Stellite "98M2" tools (left) were developed specifically for machining steel, and are also excellent tools for use on brass, bronze, and cast iron. They are hard, tough, and possess good edge strength.

Stellite Star-J-Metal Tools (right) are used on many materials, including steel and cast iron, for a wide variety of operations—including turning, boring, facing, milling, reaming, grooving and forming.

Standard Tools in Stock

SOLID TOOL BITS—Square, flat, or round . . . wide range of sizes . . . finish-ground ready for use in standard tool holders. Easily converted to various profiles.

WELDED TIP TOOLS—A variety of styles and sizes for use where solid bits are impracticable.

MILLING CUTTER BLADES—For many cutter body types, including Ingersoll, Kearney & Trecker, Modern, Production, OK, and Continental.

WEAR STRIPS—Haynes Stellite alloy castings brazed to a mild steel base, for attachment to boring, driving, and pilot bars to assure accuracy and long life.

Special Tools to Users' Specifications

Many types of special Stellite tools are regularly supplied, cast and finish-ground to users' specifications. These include solid bits, welded tip tools, milling cutter blades, reamer blades, brazed-in blade shell end mills, form tools, boring tools, counterbores, spotfacers, and reamers.

STELLITE
Reg. U. S. Pat. Off.

HAYNES STELLITE COMPANY

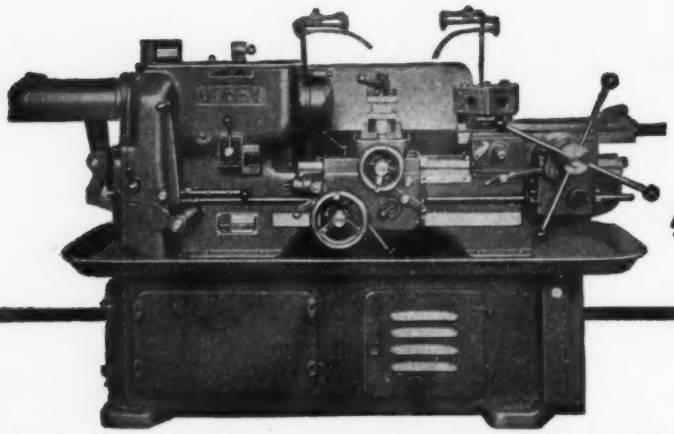
Unit of Union Carbide and Carbon Corporation

New York, N. Y. UCC Kokomo, Indiana

Chicago—Cleveland—Detroit—Houston—Los Angeles—San Francisco—Tulsa

• HIGH-PRODUCTION METAL-CUTTING TOOLS •

The words "Haynes Stellite," and "Stellite" are registered trade-marks.



MOREY DESIGNED AND BUILT
FOR PRECISION *PLUS* PRODUCTION

TURRET LATHES FOR BAR OR CHUCKING WORK

Infinite spindle speeds . . . Multiple disc clutch . . . Power feeds for the turret and cross slide . . . 8 feed changes available...Timken bearing . . . Self-locking turret . . . Automatic stops . . . Turret clamps and unclamps automatically . . . Independent adjustable stop for each turret face.

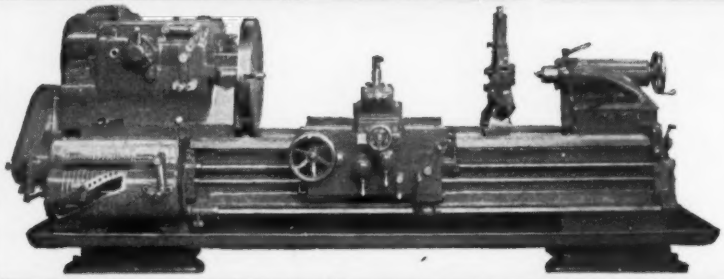
No. 2 TURRET LATHE
1" hole in spindle, 6" turning length, 14" swing over bed. Infinite spindle speeds 60 to 2000 RPM, constant speed motor, 1800 RPM.
Ask for Circular No. 629A

No. 3 TURRET LATHE
1½" hole in spindle, 10" turning length, 16½" swing over bed. Infinite spindle speeds 55 to 1800 RPM, constant speed motor, 1200 RPM.
Ask for Circular No. 727A

No. 4 TURRET LATHE
2" hole in spindle, 12" turning length, 19½" swing over bed. Infinite spindle speeds 35 to 1500 RPM, constant speed motor, 1200 RPM.
Ask for Circular No. 736A

MOREY MACHINERY CO., INC
410 Broome Street New York, N. Y.

SPRINGFIELD GEARED HEAD LATHES



for peacetime or war production!

A lathe purchased now, for round-the-clock war production, must still meet peacetime requirements. Therefore, specify SPRINGFIELD lathes —flexible, efficient, ideal for emergency or normal production. SPRINGFIELD lathes are built in sizes from 14" to 30". Write for descriptive bulletins, prices, deliveries, etc.

The SPRINGFIELD MACHINE TOOL COMPANY • • • SPRINGFIELD, OHIO, U.S.A.

HARDNESS TESTER

Let the SCLEROSCOPE speed up the production of that s so we can blow the Axis to HELL

Write for Circular!

THE SHORE INSTRUMENT & MANUFACTURING CO., INC.
9025 VAN WYCK AVENUE
JAMAICA, NEW YORK
TELEPHONE: JAMAICA 6-4090

SCHAUER *SPEED LATHES*

• for *Faster Finishing*

BURNISHING • BURRING
LAPPING • POLISHING

. . . of gears, pinions, pulleys, ball-bearing races and similar parts. Use SCHAUER Speed Lathes for increased production.

ARMY-NAVY E

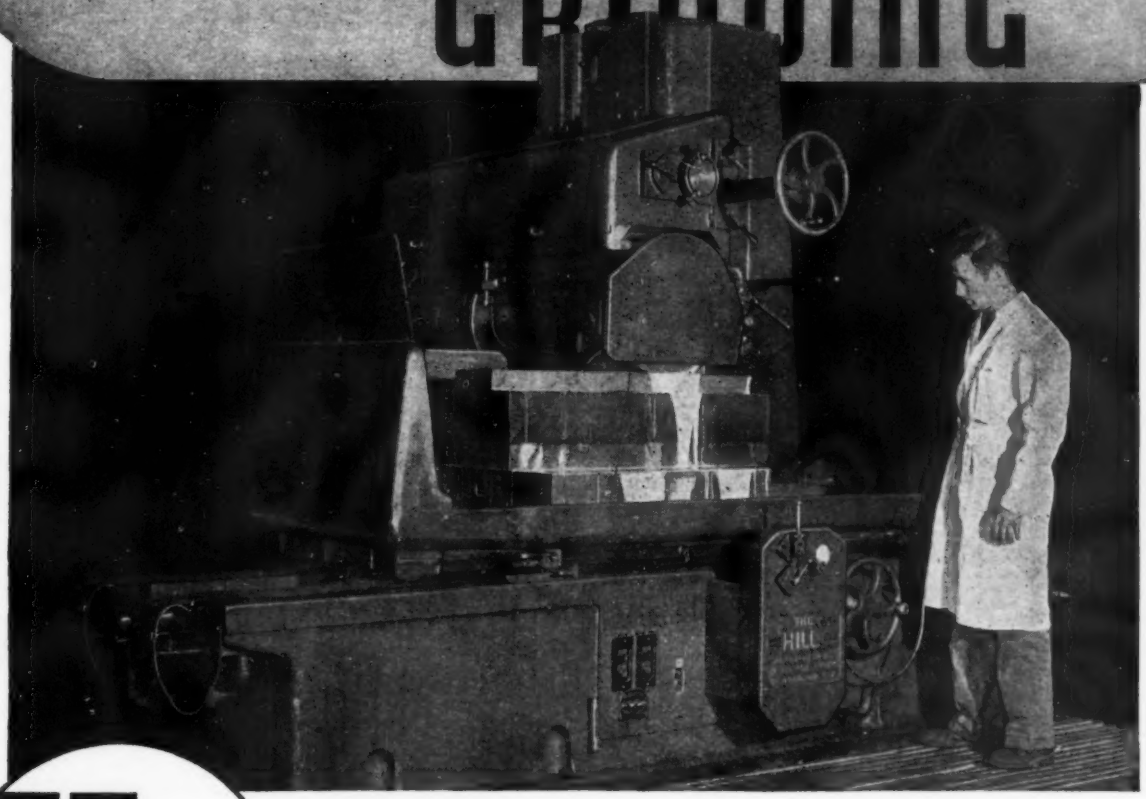
Awarded Oct. 24, 1942

"the originators of today's Speed Lathes"

SCHAUER MACHINE COMPANY

2067 READING ROAD, CINCINNATI, O.

AUTOMATIC PRECISION GRINDING



HORIZONTAL
VERTICAL

WITH the prevailing shortage of skilled manpower, the necessity for Automatic Precision Grinding equipment is greater than ever before. HILL *Open Side* Hydraulic Surface Grinders are today producing ground finishes to extremely close tolerances with operators whose experience is limited to the present emergency • Your production schedule on finish ground parts can be easily maintained with a HILL Horizontal Spindle *Open Side* heavy duty precision surface grinder • A complete range of sizes from 5 to 20 feet long are available with table widths of 18, 24, 30 and 36 in.

ALSO BUILT IN VERTICAL SPINDLE DESIGN

The HILL ACME CO.

6400 BREAKWATER AVE • CLEVELAND, OHIO

ROTOREX GRINDER FOR ALL TOOLS

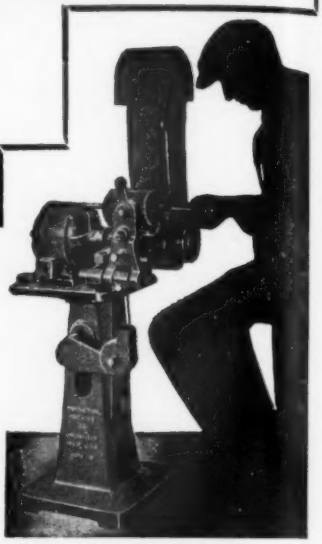
QUICK DELIVERY

Cylindrical Grinding Tap Grinding Internal Grinding

DOUGLAS MACHINERY CO. INC.
150 BROADWAY, NEW YORK, N.Y.

"PRODUCTION" TYPE S CENTERLESS POLISHING and FINISHING MACHINE . . . .

for cylindrical polishing or straight line finishing



Cylindrical work as well as flat and irregular work can be quickly and easily handled on this versatile machine.

Features include quick change from horizontal to vertical machine, a patented centerless feed for automatic handling of cylindrical work and a feed mechanism which can be quickly removed when not required.

Ball Bearing equipped throughout, the Peerless Type "S" Grinder, Surfacer, Polisher and Buffer has a 4" wide (60" long) abrasive belt and a belt speed of 3200 lineal feet per min. Capacity of centerless feed ¼ to 1" dia.

Machine in vertical position for cylindrical work.

Complete Details Available Promptly

PRODUCTION MACHINE CO.

Manufacturers of Drilling Machines, Tool Grinders and Hand and Automatic Polishing and Grinding Machines

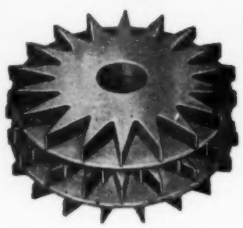
GREENFIELD, MASS., U. S. A.

Characteristic of the design of all STURDIMATIC LIVE CENTERS is a low overhang and a slight cushioning action . . .
that compensates for expansion due to heat, shock and excessive thrust loads—reducing wear to a minimum. A properly engineered live center is one of the fundamentals of setting up a job and requires a specialist's experience . . . standard shanks with Morse taper carried in stock.

Send us your specifications and blueprints—We will see that your job is set up with the right LIVE CENTER—prompt deliveries on high priorities.

STURDIMATIC TOOL COMPANY

5214 THIRD AVE. DETROIT, MICH.

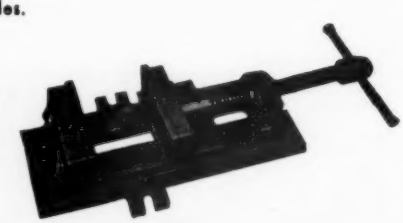


DESMOND GRINDING WHEEL DRESSERS & CUTTERS

We manufacture a complete line of wheel truing tools and can supply the proper dresser for each of your grinding wheels.

SIMPLEX *Steel Slide* VISES

A full line of Machinists, Welders, Filers, Production and Drill Press & Milling Machine Vises with solid steel slides.



Write for copy of catalog "A" and name of your nearest dealer who can supply you.

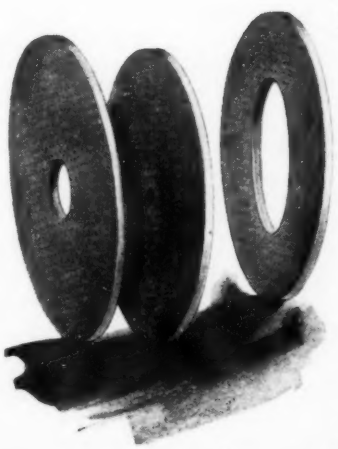
THE DESMOND-STEPHAN MFG. CO.

URBANA, OHIO

This Merry-go-round has gone to war!

1. It takes a lot of parts to make a Jeep. And this "merry-go-round" has the job of grinding some of those parts (those with flat surfaces)...in a hurry! By rotating a large number of pieces beneath a Carborundum made disc wheel, it surface grinds them in a fraction of the time required by older methods. This process is one which Carborundum helped develop.

2. Surface ground parts for jeeps, tanks and other weapons just couldn't be finished one at a time; production would be hopelessly low. The introduction of disc wheels and the "merry-go-round" surface grinder put surface grinding on a real mass production basis. The method can be used to generate flat surfaces to precision tolerances, on smallest pieces or on massive forgings and castings. It speeds production of many vital war items from valve springs to connecting rods, from piston rings to clutch plates!

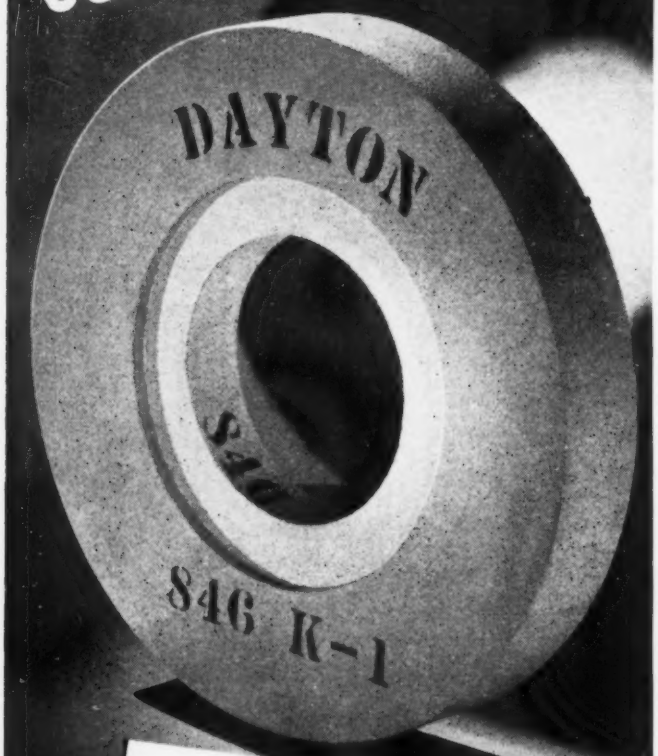


3. Careful supervision of grinding operations is vital today to conserve materials and time. The abrasive disc wheel is a "Weapon of Production" and should be properly used for maximum effectiveness. The Carborundum Company, Niagara Falls, N. Y.

CARBORUNDUM
ABRASIVE PRODUCTS

Carborundum is a registered trade-mark of and indicates manufacture by The Carborundum Company.

For SURFACE GRINDING



This 846 K-1 Dayton Grinding Wheel is Doing a Whale of a Job for Hundreds of Users.

Example No. 1. Surfacing mild steel on hydraulic grinder—giving maximum stock removal with a minimum of wheel wear.

Example No. 2. Precision grinding of hardened steel parts—with high production efficiency and giving excellent finish.

Example No. 3. Many users of this wheel have found it ideal for surfacing varied materials, saving time usually required to change wheels.

If you have a problem in surfacing or any other grinding that you haven't solved to your complete satisfaction, we may have the answer.

Write, wire, or phone—giving us an outline of your problem—and one of our experienced engineers will serve you promptly and efficiently. We may have what you need in stock.

Dayton Grinding Wheels

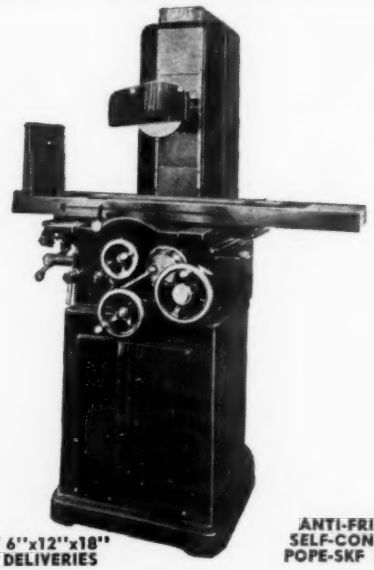
Simonds Worden White Company

712 Negley Place, Dayton, Ohio

ATLANTIC

No. 2 Automatic Precision

SURFACE GRINDER



CAPACITY 6"x12"x18"
PROMPT DELIVERIES

ANTI-FRICTION
SELF-CONTAINED
POPE-SKF SPINDLE

ATLANTIC MACHINERY CORP.

149 Broadway New York, N. Y.

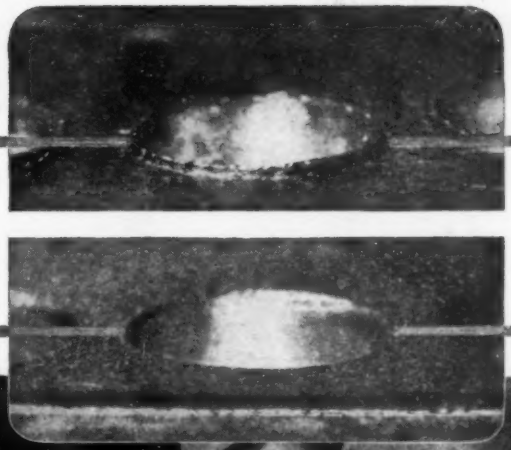
FLATNESS and SMOOTHNESS of Production Parts

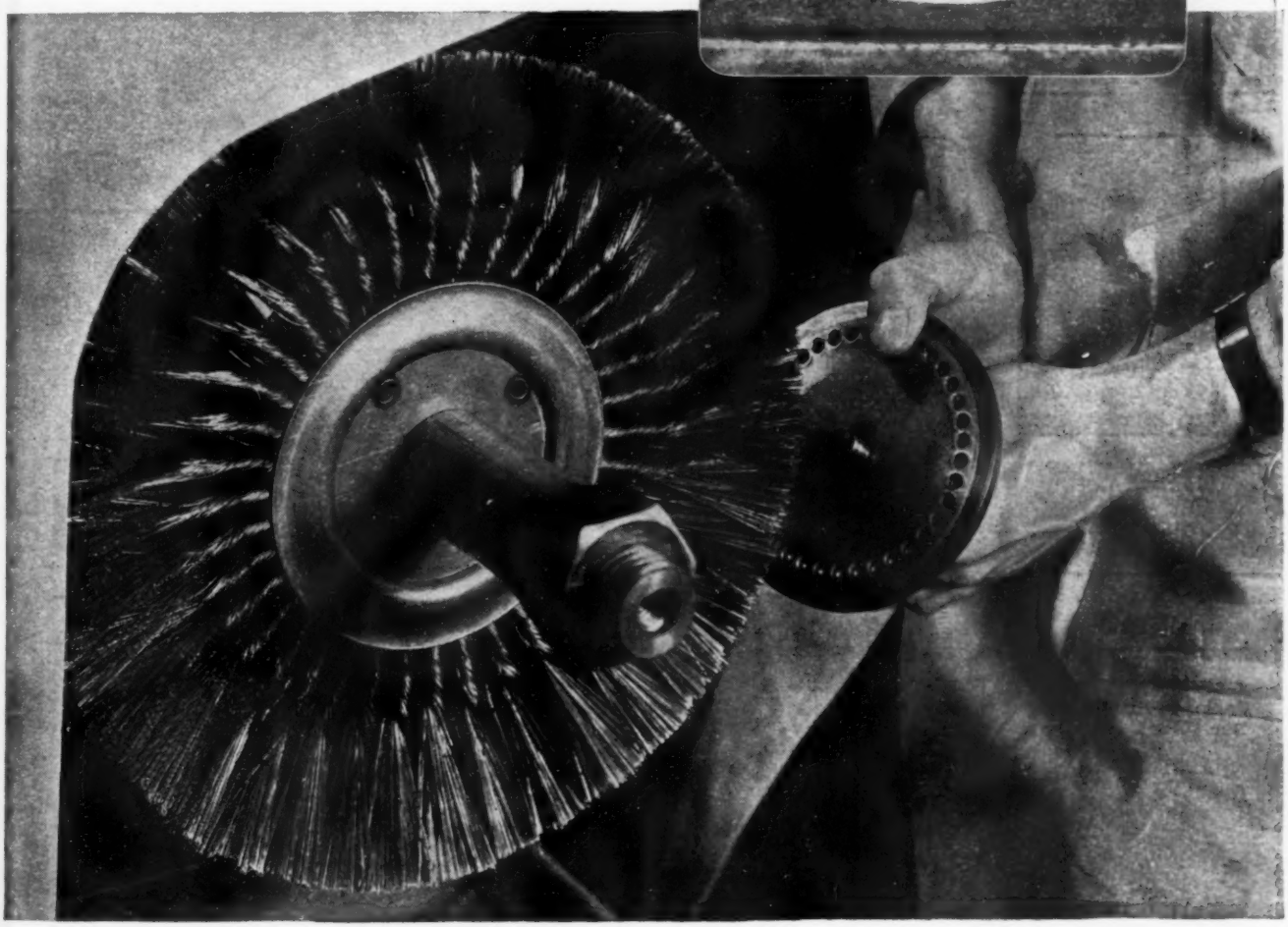
The Ultra-Lap machine will finish your parts to a flatness of one light band or less . . . to a smoothness as low as one micro-inch R.M.S., any metal or material. Much faster, more uniform than hand method. Machine designed for you or we shall be pleased to lap your parts on a job basis. Ultra-Lap machines and service used by aircraft and many other war-time industries.

Ultra-Lap MACHINE COMPANY

207 McDOUGALL AVE. · DETROIT, MICH.

It levels the hills around craters of steel





THEY'RE urgently needed, these circular plates with the 30-odd holes. By the tens of thousands they're going into a certain war-essential product.

But notice in the magnified view above, the ragged burrs that border each hole when the piece comes from the punch press. It was important to remove those burrs and break the corners.

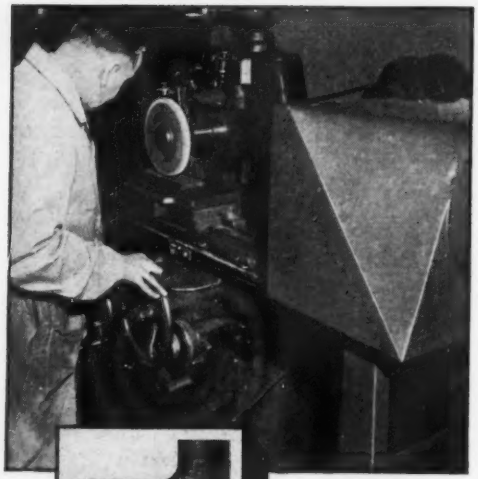
An Osborn Brushing Specialist recommended the Osborn Brushing Wheel shown above, to be used with a simple holder for the plate. The brushing action of the wheel revolves the plate on its shaft and every trace of burr is removed from all the holes in less time than it takes to tell about it. (See lower magnified view.)

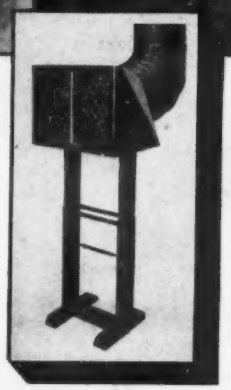
This is another example of how Osborn Brushing Wheels are speeding production and improving quality in war work. Removing burrs, breaking corners, forming radii, eliminating scratches, tool marks and other imperfections from highly-stressed parts, preparing metal for welding, and cleaning the bead afterwards . . . these are the jobs for Osborn Brushing Wheels, the jobs they do faster, better, and at lower cost.

There's an Osborn Brushing Specialist in your area ready to help war plants with war-production problems. Reach him through *The Osborn Manufacturing Company, 5401 Hamilton Avenue, Cleveland, Ohio.*

Osborn Brushes

WORLD'S LARGEST MANUFACTURER OF BRUSHES FOR INDUSTRY





The coupon will bring you this new Filtaire Folder.

Filtaire

On dry grinding and polishing operations use the Filtaire *PORTABLE DUST COLLECTOR*

Dust and dirt are costly enemies in any plant not equipped with a dust collecting system. The Filtaire Portable Dust Collector will soon pay for itself in plants where no central system exists. This inexpensive unit can be used in dozens of spots in any shop, because it is completely adjustable for any type and size of machine without using special hoods, hoses, tanks or piping. Plug it in to the nearest 110-volt outlet and it's ready to go!

The Filtaire is equipped with a fireproof Dustop filter that is inexpensive and quickly replaceable. Clean air is safe air—for operators, machines, and all plant equipment. Investigate the Filtaire by mailing the coupon today!

Please send me the Filtaire Portable Dust Collector folder which gives complete information.

NAME..... TITLE.....

COMPANY.....

STREET .....

CITY..... STATE.....

A.M.

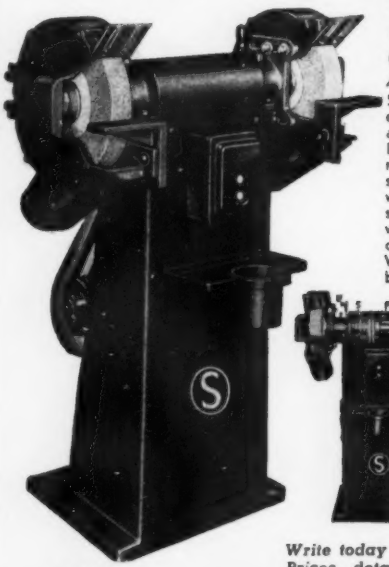
EDWARD BLAKE COMPANY

634 COMMONWEALTH AVE., NEWTON CENTRE, MASS.

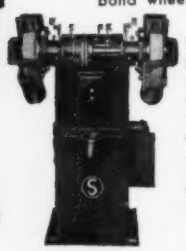
BLAKE TAP GRINDERS — FILTAIRE PORTABLE DUST COLLECTORS — AMERICAN TOOL HOLDERS — BLACK DIAMOND PRECISION DRILL GRINDERS — L & D HIGH SPEED DRILL PRESSES

STANDARD *Multiple Grinders*

A MULTI-SPEED GRINDER FOR MULTIPLE ECONOMY— Peripheral speed is maintained, thus increasing production. Wheel stubs from larger wheels, formerly discarded, may be transferred to this Grinder.



Outstanding Advantages include: Safety type hinge door exhaust guards, adjustable to wheel wear. Interlocking arrangement prevents overspeeding of grinding wheels. Push button starting. Available in wheel sizes, 10" to 30" diameter. Suitable for Vitrified and Resinoid bond wheels.



This Multi-Speed Standard Grinder operates with the same efficiency at either 25 or 60 cycles through its belt drive.

Write today for catalogue 43. Prices, detailed information.

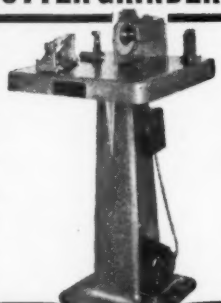
The STANDARD ELECTRICAL TOOL Co.

CINCINNATI • OHIO

2490 RIVER ROAD

The BARNES PRECISION CUTTER GRINDER

Grinds any profile desired with SPEED and ACCURACY



Regardless of how complicated or irregular the gang or cutter, the "Barnes" will grind it to the exact form desired with an accuracy that leaves nothing to be desired.

The speed and savings assured by this machine are available without any need to change existing cutter equipment. With the Barnes Precision Cutter Grinder the use of profile ground formed cutters is made possible thereby assuring the production of the high quality and quantity of work for which this type of cutter is so well known.

Write for Descriptive Circular

GENERAL MACHINERY CORP.

140 Federal St. Boston, Mass.

ABRASIVE SURFACE GRINDERS

No. 34 (VERTICAL SPINDLE)

Get acquainted with the complete line of Abrasive Grinding Machines.

Information available in Sweet's Catalog, from nearest dealer or home office.

ABRASIVE MACHINE TOOL COMPANY

EAST PROVIDENCE RHODE ISLAND

MACKLIN
GRINDING WHEELS

THAT WHEEL YOU RECOMMENDED HAS ELIMINATED OUR BOTTLE-NECK AND NOW OUR PRODUCTION IS REALLY GOING TO TOWN
THATS MY JOB "PROTECT YOUR PRODUCTION"
MACKLIN FIELD ENGINEER

Macklin Grinding Wheels are made in all sizes and shapes for every type of grinding job. An experienced Macklin Field Engineer is available at all times for the asking—no obligation.

DON'T TAKE BONDAGE - INVEST IN WAR BONDS

MACKLIN COMPANY

Manufacturers of GRINDING WHEELS — JACKSON, MICHIGAN, U. S. A.

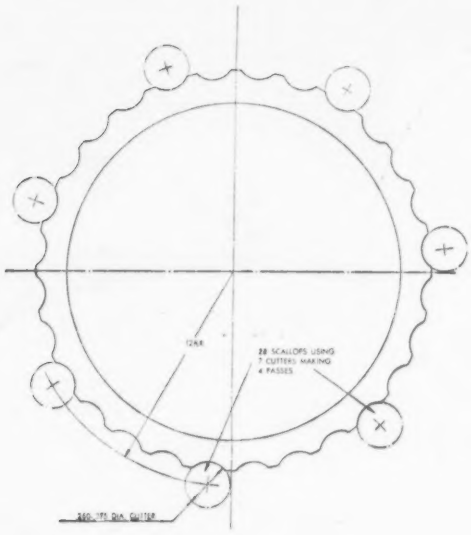
Distributors in all principal cities

Sales Offices: — Chicago - New York - Detroit - Pittsburgh - Cleveland - Cincinnati - Milwaukee - Philadelphia

HOEFER MILLING HEAD

MACHINES 28 SCALLOPS • • • • • • 4 OPERATIONS

7 Scallops Cut at one time in 12.8 Seconds • • •



• 7 spindle head for machining 28 scallops—4 operations material — SAE — 4140—Brinnell 241-285 Cutters—2⅝" dia.—73 r. p. m. — 50' per minute. Feed .003 per tooth .024 per revolution. 1.752" penetration per minute. Depth of cut ⅜".

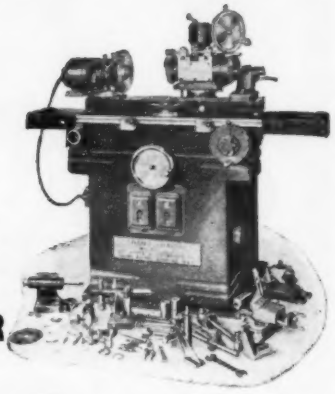
• You pay for drilling one hole *only* when you use a Hoefer Head—all the other holes are drilled at no extra cost. More than that, all other holes over one are drilled in the time it takes to drill one hole. There are many combinations that can be worked out to suit your individual problem just as the Hoefer Head for the job featured here was developed. To increase production speed—to decrease cost of drilling and allied operations simply add Hoefer Heads to your present machines—save floor space—operators can accomplish more without fatigue.

Our engineers will be glad to tell you how a Hoefer Head can be designed for your work and applied to your drill presses and turret lathes. Write for our Catalog F.

HOEFER'S WHOLE BUSINESS IS HOLES

HOEFER MFG. CO. *Freeport, Ill.*

GRAND RAPIDS



ULTRA MODERN CABINET BASE TOOL and CUTTER GRINDER

with

BALL BEARING TABLE AND OTHER EXCLUSIVE FEATURES

★ ★ ★

EXTREME FLEXIBILITY FOR COMPLEX GRINDING OPERATIONS

GALLMEYER & LIVINGSTON CO.

330 Straight Ave. S. W. Grand Rapids, Mich., U. S. A.

HOLMAN

BETTER, FASTER HOLE FINISHING

HELICAL TAPER PIN REAMERS

Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

HOLMAN REAMER CO.
MANCHESTER, CONN.

BARNESDRIL

Honers . . . Drillers

Write Today for Catalog A.

DRILLERS BARNESDRIL HONERS

Barnes Drill Co.

830 CHESTNUT ST. ROCKFORD ILLINOIS, U. S. A.

Don't Overlook This Possibility for Increased Production

★ ★ ★

NICHOLSON *Expanding* MANDRELS

Save Time
Improve Shop Efficiency

Equip your shop with these economy tools for holding work while being machined. Hardened tool steel—precision ground.

Two types. All sizes. Sold singly or in sets. Prompt delivery. Bulletin No. 741.

W. H. NICHOLSON & CO.

114 OREGON ST., WILKES-BARRE, PA.

Other Products: Arbor Presses—Control Valves—Steam Traps—Etc.

DON'T STOP SPINDLES TO CHANGE TOOLS!

REDUCE IDLE TIME!

Modern-Magic Chuck Change Chuck and Collet Equipment has reduced the idle time of revolving spindle to practically zero. With this Chuck, tools can be changed without stopping or even slowing down the spindle. This gives practically multiple spindle range to single spindle machines.

Any tool or group of tools being used in revolving spindle machines can be used in Modern-Magic Chucks with a saving in tool inserting and removing time.

Simple design and durable construction insure a long trouble-free life for this tool. It is extremely simple in operation. For complete information send for Bulletin M-101. It's free!

CONSOLIDATED MACHINE TOOL CORPORATION

MODERN TOOL WORKS

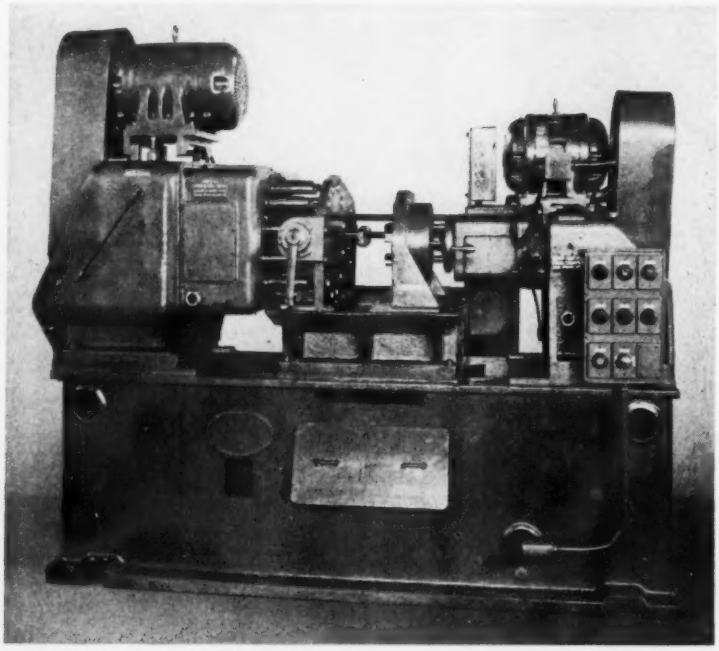
DIVISION

ROCHESTER, NEW YORK

Let Buhr PATENT

MULTIPLE SPINDLE
DRILL AND TAP HEADS

put your idle machines on the production line



A base and motors brought out of storage and retooled with a holding fixture;

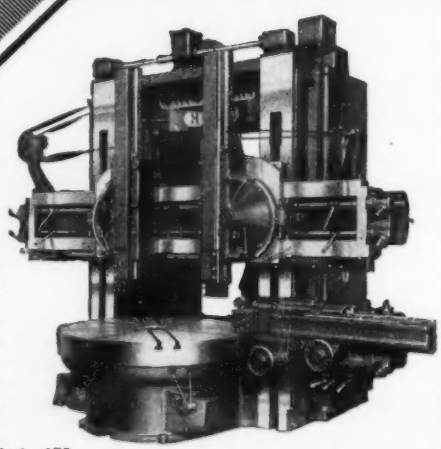
A 19-Spindle Tapping Head on Left Side and an 8-Spindle Tapping Head on Right Side.

All spindles are provided with vertical adjustment to secure proper tap depth, and each head has an oil pump for positive lubrication and freedom from wear.

BUHR MACHINE TOOL COMPANY, ANN ARBOR, MICH.
Specialists in Multiple Spindle Drilling, Boring, Reaming, Tapping Equipment

---

CINCINNATI BORING MILLS



MORE WORK With A HYPRO

Here are a few construction points that account for greater production and lower costs. Spiral bevel table gear — Timken equipped speed box —convenient controls — and anti-friction roller bearing rail head. Built in sizes from 54" to 12' inclusive. Write for bulletin 175.
The Cincinnati Planer Co. also builds Hypro Planers and Planer Type Milling Machines.

THE CINCINNATI PLANER CO.
CINCINNATI, OHIO

LELAND-GIFFORD COMPANY · WORCESTER MASS. U.S.A. · MACHINE TOOLS · CRANK SHAFTS

Drilling and Tapping Machines
(Automatic and Semi-Automatic)
LELAND GIFFORD CO.
WORCESTER, MASS.

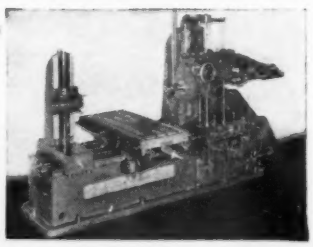
LUCAS "PRECISION"
Horizontal Boring, Drilling and Milling Machine
THE LUCAS MACHINE TOOL CO.

NOW AND ALWAYS OF

CLEVELAND
OHIO, U. S. A.

UNIVERSAL *Horizontal Boring Machine*
The only TRIWAY *Boring Machine Built*

Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.



Standard Universal 3" Spindle Machine

UNIVERSAL BORING MACHINE CO.
Hudson, Mass., U. S. A.

SAVE TIME • SPEED PRODUCTION with CLAYTON *Boring Bar Holders —and Boring Bars*

EXCLUSIVE CLAYTON FEATURES

1. Tool bits can be raised or lowered by releasing one nut, which DOES NOT disturb alignment of bar with lathe.
2. "Stickout" length can also be altered without changing alignment.
3. Complete bar and holder can be removed from lathe compound and replaced without losing tool bit setting.
4. Solid one-piece steel bar of full diameter contributes to extreme rigidity and strength, and eliminates chatter.
5. No file or chalk marks required when boring blind holes, because of ¼" graduations etched into bars.

Clayton Boring Bar Holders are a real improvement over conventional holders. They employ an entirely new and better clamping arrangement—are more rigid—and permit deeper cuts. By reducing set-up time they quickly repay original investment. Due to their many exclusive advantages, CLAYTON HOLDERS have replaced other Bar Holders in hundreds of plants. It will pay YOU to investigate Clayton Boring Bar Holders regardless of the Holder you are now using.

PROMPT DELIVERIES ASSURED
Order from your local supplier or direct from factory

ARMY E NAVY

CLAYTON MANUFACTURING COMPANY
ALHAMBRA, CALIFORNIA

Now—At Last—The New American Machinist "Shell Book"

Are you making bullets, shot, shell, cartridge cases, cartridge clips? Here in one giant volume are all the recent *American Machinist* Armament Sections on the subject. It's 250 pages, 8½ x 11 in., including the information in a normal 750-page handbook!

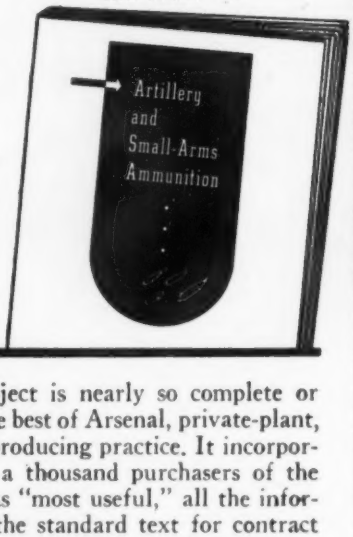
ARTILLERY and SMALL-ARMS AMMUNITION

This tremendous volume is *twice* the size of the earlier *American Machinist* "shell book," with all the new data. Included are "standard" shell lines, the famous shell-tooling series by B. C. Brosheer, and the other articles which exhausted our supply of the first book in 125 days. Added are 115 pages of *new* data — *yet the price remains at $1 postpaid.*

HERE ARE THE SUBJECTS COVERED:

Bullets for Britain—Made in Canada
Ammunition for the Air Force (.30- and .50-cal.)
Shell Forging by the Upset Method
3.7-in. Shell Forgings
Forging 155-mm. Shell Bodies
Shell for British 75-mm. Guns
Standard Machines for Shell Production
How to Machine 75-mm. Shell (Frankford Line)
Line Production of 3-in. Anti-Aircraft Shell
One Gage Instead of Many
Tooling Set-Ups for High-Explosive Shell (5 parts)
Canada Supplies 40-mm. Shell
Aircraft Bomb Fuzes
Producing Percussion Fuzes
Machine-Gun Cartridge Links
Heat-Treating Cartridge Links
How to Make Artillery Cartridge Cases
Shell Cases Made in Canada
Shell-Fabricating Equipment (New-Machine review)

250 pages—8½ x 11 in.—fully illustrated—$1



No other book on this subject is nearly so complete or authoritative. It combines the best of Arsenal, private-plant, and Canadian ammunition-producing practice. It incorporates all the data that over a thousand purchasers of the first "shell book" classified as "most useful," all the information which has made it the standard text for contract discussions between makers and the Ordnance Department, and all the new information.

DON'T MISS THIS OPPORTUNITY! Send in your dollar TODAY with the coupon below. We'll send your copy of the new ammunition book prepaid at once. Get your copy while the supply lasts.

MAIL THIS NOW!

AMERICAN MACHINIST • 330 West 42nd St., New York, N. Y.

Send me at once, postpaid, ...copies of "Artillery & Small-Arms Ammunition" @ $1.00. I enclose $..... (check, money order, stamps or cash)

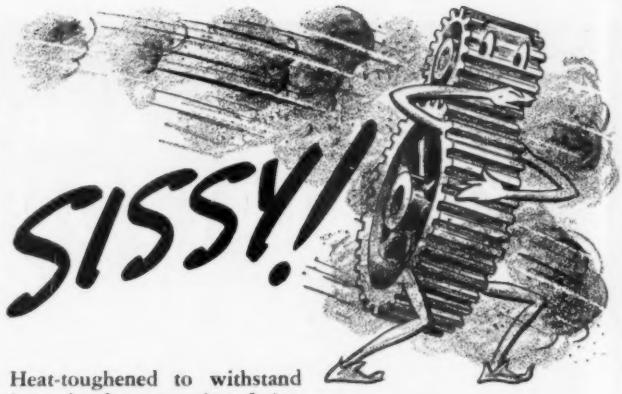
My Name .....

My Address .....

City and State .....

My Position is .....

Company Name .....



Heat-toughened to withstand long, hard usage, close-fitting parts of your shop machinery fall easy prey to an attacking stream of abrasive projectiles from the wheels of grinders and buffers. Just as defenseless are the lungs of even your most rugged workers.

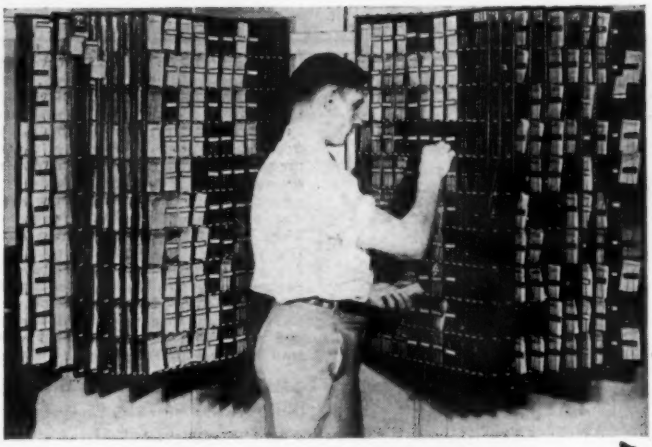
Trap these atomic "Fifth Columnists" at their source. Get the easy-to-install, easy-to-clean Cincinnati Air Master. Three sizes to assure proper fit. Write today for descriptive bulletin.

The Cincinnati
ELECTRIC DRILLS • GRINDERS • BUFFERS • PORTABLE TOOLS
The Cincinnati Electrical Tool Co.
DIVISION OF THE R. K. LE BLOND MACHINE TOOL CO., CINCINNATI, OHIO
2676 MADISON RD

AIR and HYDRAULIC
Hanna Cylinders
Dependable power for pushing, pulling or lifting. Standard models, air or hydraulic, low or high pressure, for all requirements. Write for full details.
HANNA ENGINEERING WORKS • 1767 ELSTON AVE., CHICAGO

DIES TAPS
GEO MET RIC
Right from the Lead
THE GEOMETRIC TOOL CO.
NEW HAVEN, CONN.

MILLHOLLAND
Automatic DRILLING - BORING MILLING - TAPPING Units
½ to 20 HORSEPOWER DRIVE
AUTOMATIC and SEMI-AUTOMATIC PRODUCTION MACHINERY
W. K. MILLHOLLAND MACHINERY CO.
Indianapolis, Ind.



MORE PRODUCTION WITH LIMITED MAN POWER

McCaskey VISIBLE Control

transfers the burden of output from man to machine—where increased production must be secured . . .

Production management's big job for 1943 is to find the way to further increase production while losing experienced manpower to the war services. This is a problem of attaining more output per machine—of stepping up and maintaining production under the handicap of manpower shortage.

McCaskey Production Control offers a solution that is proving effective in numerous war plants. It is based on realization that machine output frequently is limited only by the ingenuity of production management in the planning and control of methods and procedure. The McCaskey system provides graphical control, available at a glance, of every step from the planning of production to final operations or assembly.

All data pertaining to specific orders or operations are recorded *but* once. Rapid filing is all that is required to make available visual control *plus* the original records on which it is based, without time consuming delays and voluminous clerical work. Posting of numerous records is totally eliminated.

Maximum production requires flexible control, based on up-to-the-minute data . . . control that is not bogged down by details and clerical routine. McCaskey visualizes the data essential for sound planning and performance—for more production with limited manpower.

TYPICAL NEEDS SATISFIED BY McCASKEY PRODUCTION CONTROL

. . . Flow of finished parts coordinated to avoid assembly delays resulting from missing units.

. . . Progress record showing immediate status of any or all orders at a glance.

. . . Forecast of production delivery.

. . . Overdue orders eliminated or under control.

. . . Machine scheduling, departmental machine loads and job assignment to keep all machines busy all the time and run jobs in proper sequence.

. . . Check of machine production to assure realization of production standards.

. . . Production follow-up without dependence on stock chasers.

. . . Day to day cost and payroll data for immediate control of unexpected increases.

. . . Unified control of inventories of material, purchased parts, parts produced, sub-assemblies, tools, supplies, etc.

. . . Tool crib control providing more production with less tools.

These typical requirements suggest in general what may be accomplished through McCaskey. Although the specific needs of plants and departments differ, the flexibility of McCaskey Production Control makes it adaptable to practically any of the severe production conditions existing today. You name yours and McCaskey will satisfy them. Write us for suggestions. No obligation, of course.

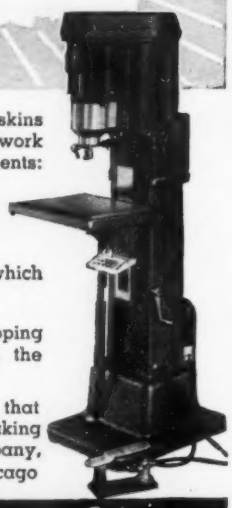
THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems Ltd., Galt, Ontario, Canada — *The McCaskey Register Co., Watford, England*

McCASKEY INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • MAINTENANCE • TOOLS • COSTS • PAYROLL

AMERICA'S MOST ADVANCED TAPPING MACHINE



There's no tolerance problem on Haskins equipment. Absolute uniformity of work results from three Haskins developments:

Air Control which makes precision fit a constant factor, independent of operator efficiency.

Efficiently Engineered Fixtures which greatly simplify the handling of parts.

Piece-Part Control which makes tapping automatic except for placing parts in the fixture.

Send for TAPPING TIPS—new literature that gives many money-saving, money-making ideas. R. G. Haskins Company, 2761 W. Flournoy St., Chicago

HASKINS

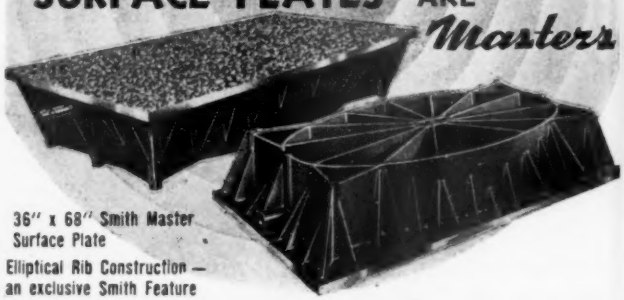
HASKINS *Precision* TAPPING EQUIPMENT

For SPEED, ACCURACY and CLOSE TOLERANCE Assembly and Inspection—

Production methods today demand streamlined efficiency in men, machines and tools. Surface plates of precision accuracy must contribute, as never before, to unparalleled accuracy in production and of these the Smith Master Surface Plate is an outstanding example. Plants engaged in aircraft and ordnance production throughout the country have expressed their complete satisfaction by frequently reordering. For your sensitive, precise and accurate inspection depend on Smith Master Surface Plates. Prompt delivery on a large variety of standard sizes up to 48"x96". For prices and delivery wire, phone or write.

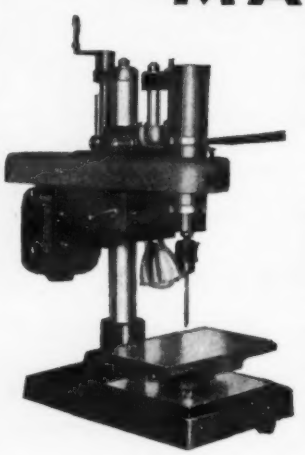
SMITH TOOL & ENGINEERING CO.
Precision Measuring Equipment
851 N. Sandusky Ave. Bucyrus, Ohio

Smith Master SURFACE PLATES ARE *Masters*



36" x 68" Smith Master Surface Plate
Elliptical Rib Construction — an exclusive Smith Feature

MAXI-JR-E



Super Sensitive Drilling Machine

• Designed and built for accurately drilling small holes .004" to .250" diameter. It consists of a self-contained drilling unit which swings radially on the column and may be locked in any desired position.

Here's an exceptionally flexible small drilling machine which is easy to operate and may be ganged for sequence operations or to obtain greater production.

Another distinct advantage is the full floating spindle of special design which eliminates radial belt pull on the spindle.

Distance from center of chuck to column, 5 inches. Vertical work capacity from base to chuck, 10 inches. Spindle speeds from 750 to 12,000 R.P.M. Write for full descriptive bulletin.

for

- **BETTER SEEING**
- **BETTER FEELING**
- **BETTER DRILLING**

The Hamilton Tool Co.

830 NINTH ST HAMILTON, OHIO

ERRINGTON

Main Office and Works, Stapleton, Staten Island, N. Y.

TAPPING CHUCKS

NEW YORK
170 Broadway

BOSTON
830 Old South Bldg.

CHICAGO
6422 N. Richmond Street

CLUTCH OR CONE DRIVE

Our High Speed Tappers are Super-Sensitive for Small Tapping

Style B Positive Stop Holds Work Down.

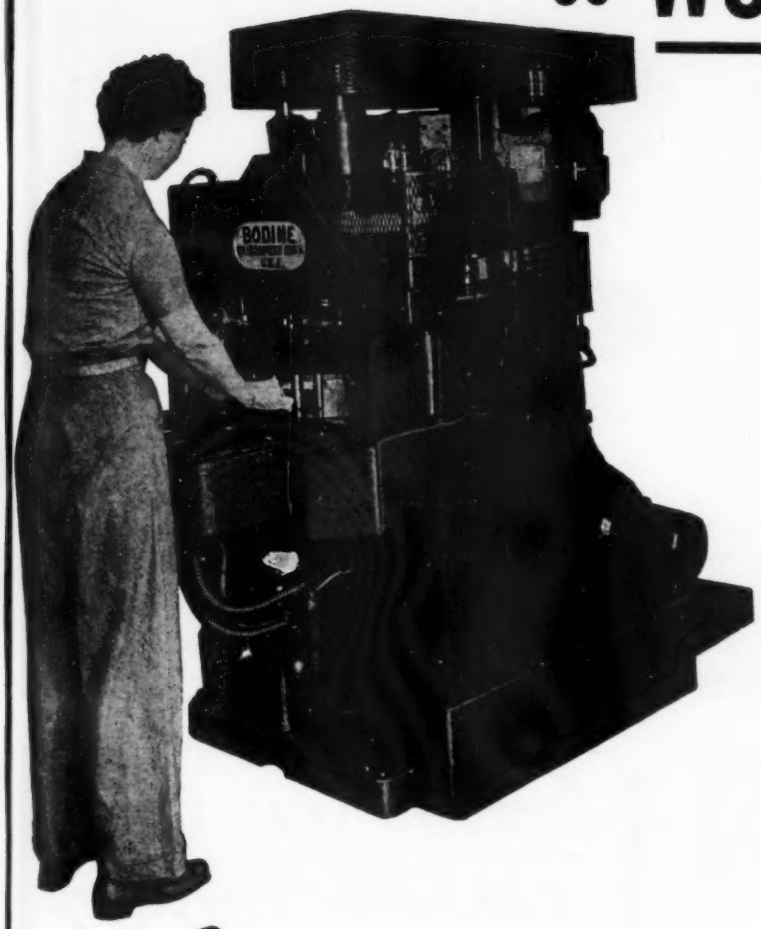
Style C Graduated Adjustable Safety Friction.

DRILL PRESS TURRET

Style D-E with Quick-Change Tool Holders to Drill, Tap and Set studs, etc., without moving work, or stopping or reversing machine. Individual friction adjustments in each tap-holder, if required.

Also, Opening Die-Heads; Opening Stud-Setters; Friction Screw-Drivers and Nut-Setters, etc.

Bodine built MAGIC into the machine so WOMEN can work production wonders



DRILLING, MILLING, TAPPING, SCREW INSERTING *Simultaneously*

One of the things that has helped American industry "show the world" in war production has been the progress made in developing automatic machinery that relieves the operator of all unnecessary physical exertion as well as much of the responsibility for accuracy in the finished work. Operating a Bodine machine is clean, simple, yet interesting work that women or older workers can do with minimum training. And they have the satisfaction of daily chalking up a very real contribution to victory because Bodines handle multiple operations on ordnance parts and other vital war material at rates up to thousands of pieces per hour.

The six standard Bodine machines carry from 6 to 8 spindles, flexible as to location around the dial, operable from vertical, horizontal or inverse position . . . simultaneously, in one cycle of the automatic indexing dial. Capacities range from ¼" to ½" diameter, with vertical stroke from $\frac{3}{16}$" to 3½" in depth.

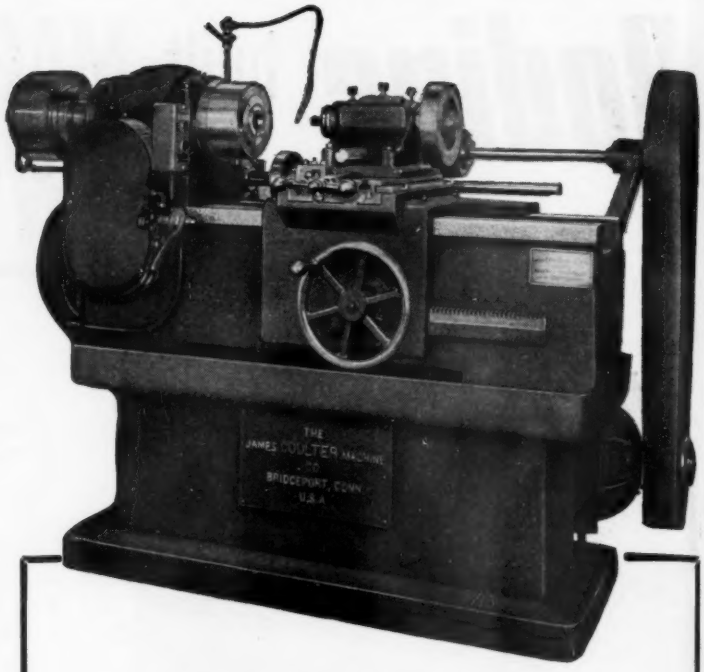
We can't prove it but it seems likely that the operator of a Bodine machine will enjoy the work and be less liable to take those costly Monday morning vacations.

Bodine's descriptive catalog showing typical set-ups for multi-machining operations should suggest better and faster ways to process small parts. Copy sent on request.

THE **Bodine** CORPORATION
BRIDGEPORT CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

Keep Ahead of DEFENSE DEMANDS on the PRODUCTION of EXTERNAL and INTERNAL THREADS



The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.

Send for Descriptive Bulletin giving full information.

The James COULTER Machine Co.
BRIDGEPORT · CONNECTICUT · U.S.A.

BURKE MILLING MACHINES

. . . Put Your Small Work on a Production Basis!

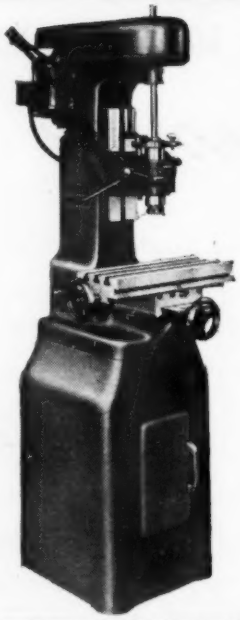
Those small, difficult jobs can be handled on a *production basis* with BURKE Motor Driven Milling Machines Nos. 1, 2, 3, & 4. Primarily, this is because BURKES have been *specially designed and built* to do smaller milling jobs efficiently and economically.

Then, too, a number of attachments are available . . . attachments that increase the units usability, and add to your productivity. These include a vertical milling attachment, index centers, and vises — 3 types, including swivel base. Now, when production must be stepped up, is the time to investigate the profit possibilities of BURKE Milling Machines, as applied to your work.

Complete Information Will Be Sent You Upon Request—Write!

BURKE MACHINE TOOL CO.
CONNEAUT · · · OHIO

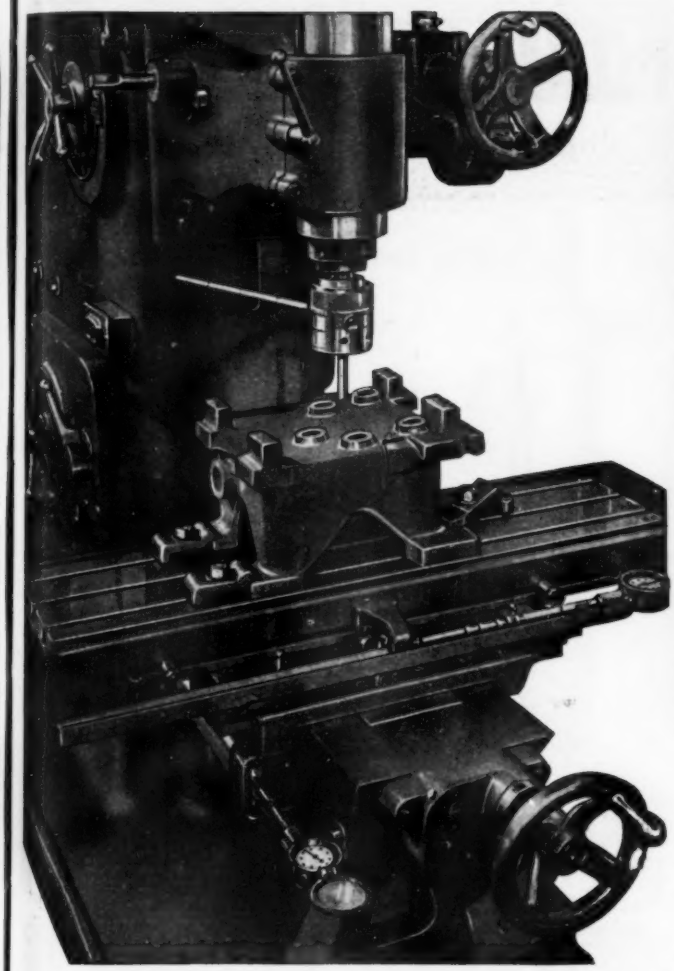
Sure Fire INVESTMENT FOR "SWAMPED" *Tool Rooms*



LINLEY
HIGH SPEED VERTICAL MILLING and JIG BORING MACHINE

For precision accuracy on small jigs, dies, patterns, fixtures, molds, etc., the LINLEY is a profitable jack-of-all trades machine for busy tool rooms . . . especially in releasing larger machines for their rated work. Eight spindle speeds—one for every need; direct reading micrometer depth gauge, an entirely new feature which permits accurate machining to predetermined depths *without* pencil figuring . . . *without* error; floor space only 18½ x 20 . . . a rugged, compact machine with large capacity. Write for Bulletin to Linley Bros. Co., 664 State Street Ext., Bridgeport, Conn.

LINLEY BROS. CO., Bridgeport, Conn.



A typical jig boring job is done on a KNIGHT Miller. With dial indicators, all five holes were accurately located and bored. At the same setting, the corner pads were milled, insuring squareness with the bored holes.

- Internal and external milling is done at one setting
- Step milling is made easy by getting vertical adjustment on spindle
- Profiling, boring, and slot-milling is all done at one setting
- Precision boring is done, using dial indicators for accurate locating
- Rigid spindle makes possible deep end milling
- Jig boring is possible becauuse of dial indicators
- In experimental work you can machine many jobs completely on this one machine and handle difficult operations without special equipment
- For limited and special production you can keep costs down and maintain quality without special tooling

WRITE FOR NEW CATALOG

Wide Range

KNIGHT Millers ADD SPEED TO EACH SHIFT'S PRODUCTION···

KNIGHT VERSATILE MILLERS ACCURATE-RIGID

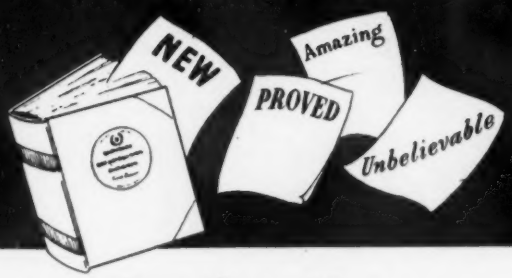
Large work or small—milling or boring, roughing, or accurate finishing cuts—all are handled to equal advantage on this wide range machine. Sixteen changes in speed, in either direction, give the spindle ample range to meet a wide variety of requirements.

Greater speed is realized by users of KNIGHT Millers because of (1) the short time required to make set-ups, particularly difficult ones (2) the elimination of additional set-ups or at least the simplification of them (3) the quick and accurate location of holes and surfaces, especially when dial indicators are used (4) the quick change of vertical settings by moving the spindle instead of the work (5) the fast method of changing cutting tools (6) the swiveling table which greatly reduces the most expensive element in tool room operation—that of time waste in set-up work.

Subject to prior order immediate delivery.

W. B. KNIGHT MACHINERY CO.
• ST. LOUIS, MISSOURI •

We are throwing the Dictionary at this one!



Another New Engineering Development *by Wheel Trueing Tool Co.*

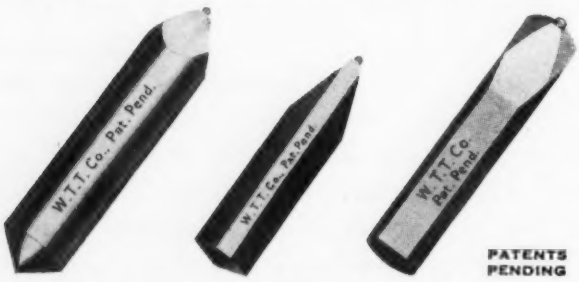
NEW TYPE THREAD GRINDING DIAMOND TOOLS

Equally effective in forming the wheel that grinds Whitworth, Buttress, Acme, or any other Special or Standard Thread.

Here's the pay-off: Gets the form quicker, holds it longer (*much longer*), does it faster, can be delivered sooner, serviced faster. Why? Because we have found out how to take advantage of diamond characteristics *never before utilized.* In one plant, production was increased 500% and the cost of each piece reduced 75%. In another plant, original production of 8 units per machine per day was increased to 80 units with no change except the use of these new type tools. But, the *best* proof is to *try them yourself.*

Tell us exactly what you want to do—We will furnish the TOOL TO DO IT

BETTER . . . FASTER . . . at LOWER COST



PATENTS PENDING

EX-CELL-O JONES & LAMSON DALZEN

Available Only from

WHEEL TRUEING TOOL COMPANY

3200 W. DAVISON • DETROIT, MICHIGAN

NATIONAL KEYSEATING MILLER

. . . the tool that converts drilling machines into key-seaters and saves time and money

• With this modern tool you can handle keyseating jobs not suitable for keyseating machines on any of your drill presses or radials. Keyseats with parallel sides, accurate in depth and in perfect alignment with bore axis are assured.

The National Keyseating Miller mills, keyseats in one cut. It can be used on taper holes, offset holes, blind holes and for taper keys. Work clamping is unnecessary. We also manufacture oil-grooving millers.

Made in twenty-six different diameters from ½" to 3½". Several widths of cutters can be used in each size.

WRITE TODAY FOR OUR NEW CATALOG NO. 15

NATIONAL MACHINE TOOL CO.

CINCINNATI, OHIO

MOREY *Designed and Built FOR Precision PLUS Production*

VERTICAL SHAPERS 8"–12"–14" STROKES

Four cutting Speeds . . . infinite feed variations quickly selected . . . Directional control for all movements . . . Rapid power movements in all directions . . . Brake for Ram automatically applied...OPERATOR CONTROLS MACHINE WITHOUT MOVING FROM HIS WORKING POSITION . . . Timken Bearings for Bull Gear, Shaft and Rotary Table . . .

ACCURATE, POWERFUL, FAST, FINGERTIP CONTROL

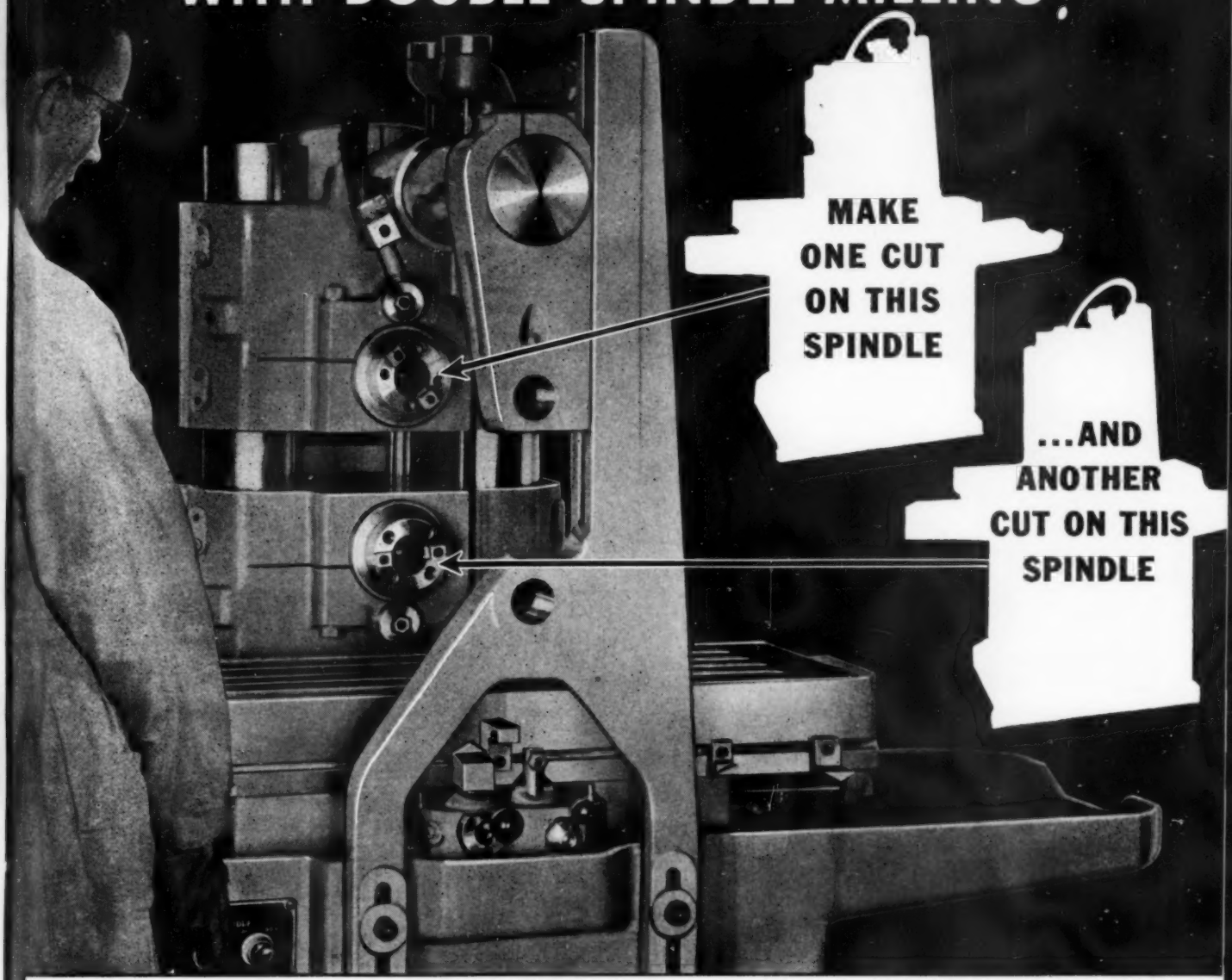
Ask for Circular No. 726A

MOREY MACHINERY CO., INC

410 Broome Street New York, N. Y.

One MACHINE DOES THE WORK OF *Two*

WITH DOUBLE SPINDLE MILLING!



Double Spindle Machines available in the No. 2-20DS (above) Table 42" x 12" and the No. 1-14DS Table 32" x 9"

THERE'S A KENT-OWENS REPRESENTATIVE NEAR YOU

BOSTON
General Machinery Corp.
BUFFALO
Don W. Patterson
CHICAGO
Neff, Kohlbusch & Bissell
DALLAS
Hamilton-Huster Machinery Co.
DAYTON
Gosiger Machinery Co.
DETROIT
A. C. Haberkorn Machinery Co.
GRAND RAPIDS
Joseph Monahan
HOUSTON
Oliver H. Van Horn Co., Inc.
INDIANAPOLIS
Oatis-Booth Machinery Co.
KANSAS CITY
Eichman Machinery Co.
LOS ANGELES
Eccles & Davies Machinery Company
Harron, Rickard, & McCone
MILWAUKEE
Neff, Kohlbusch & Bissell
MOLINE
John J. Normoyle Co.
MONTREAL
F. F. Barber Machinery Co.
NEW ORLEANS
Oliver H. Van Horn Co., Inc.
NEW YORK
Wilson Brown Company
PHILADELPHIA
Calco Machinery Company
PITTSBURGH
Barney Machinery Co.
ROCHESTER
F. W. Schiefer Machinery Company
SAN FRANCISCO
C. F. Bulotti Machinery Co.
SEATTLE
Star Machinery Company
ST. LOUIS
Blackman & Nuetzel Machinery Company
Clarke Equipment Co.
SYRACUSE
J. F. Owens Machinery Co.
TORONTO
F. F. Barber Machinery Co.
WALKERVILLE
F. F. Barber Machinery Co.

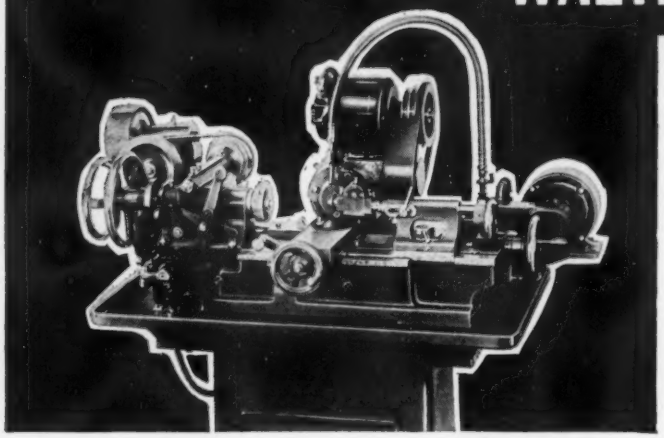
● Manpower and machine-power do a double job . . . with Kent-Owens Double Spindle Milling Machines!

Typical operations for these machines include: (1) sawing or splitting full circle bearings into two parts; (2) face milling two parallel surfaces or milling two parallel slots at the same time; (3) milling gear, cutter, spline and ratchet teeth . . . milling two opposite teeth simultaneously.

Thus, whenever the character of the work permits two cuts at the same time on the same piece, or the handling of two identical or different parts simultaneously, these machines will practically *double production!* Contact your nearest representative or write us. Kent-Owens Machine Company, Toledo, Ohio.

Call on KENT-OWENS *for Milling Machines*

HIGH PRODUCTION WITH MAINTAINED ACCURACY
assured by WALTHAM THREAD MILLERS

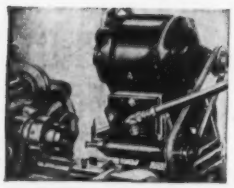


These sturdy machines—for either tool room or production use—will mill a wide variety of standard threads to highest precision standards. Cutters can be supplied for producing such forms as V, N, Whitworth, Buttress, etc. They are best adapted to work 2" or less in diameter but will handle 3" work.

Improved design of these machines has been realized by the use of three motors. Greater rigidity of the cutter head and increased speed range have been attained. By providing three motors individual speed change and reverse for both the cutter and the work as well as a constant speed for the pump are realized.

Standard equipment includes three motors with push button start and automatic or push button stop, follow rest, one milling cutter, indexing device for cutting multiple threads, 5 pitch lead screw and 13 change gears for cutting from 5 to 40 threads per inch.

A wide range of extra equipment and attachments is available for extending the usefulness of this machine. Full and complete details available promptly on request.



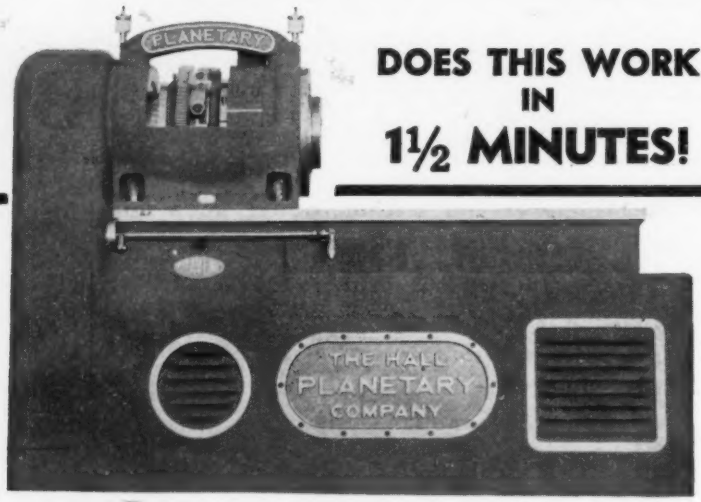
Machine equipped with Internal Threading Attachment involving a special motor driven cutter head which may be swivelled to helix angle. Cutter may be centered for varying length of arbors.

Machine equipped with Relieving Attachment. A special work head with spindle geared to a camshaft replaces lead screw and is connected by levers to move cutter in and out. A compound taper attachment is also included.

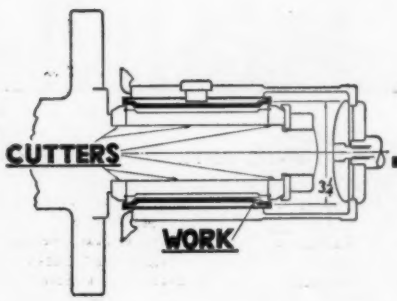
WALTHAM MACHINE WORKS WALTHAM MASS.

WALTHAM TRADE MARK REGISTERED U S PAT OFF

PLANAMILLING



DOES THIS WORK IN 1½ MINUTES!



THE HALL PLANETARY PATENTED MILLER

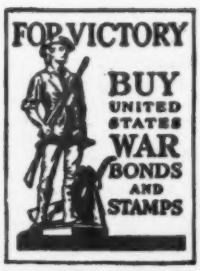
The job is a small generator frame for airplanes. The inside diameters and both end faces are milled in one operation.

It's another example of how you can do an accurate internal machining job quickly by Planamilling it.

Present your milling and threading problems to Hall.

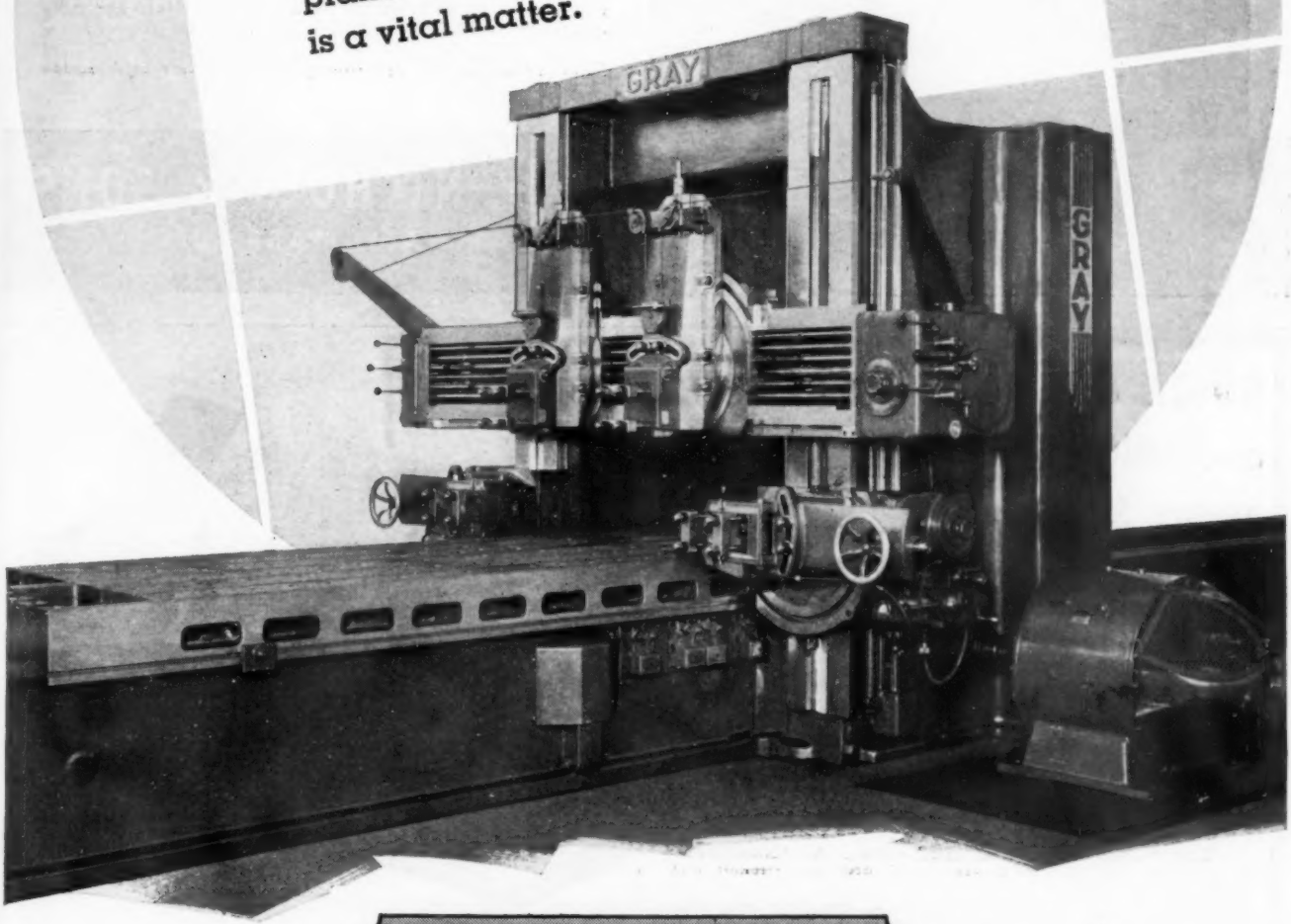
THE HALL PLANETARY CO.

Fox and Abbotsford Ave. **PHILADELPHIA, PA.**



ONE MOTION DOES IT . . .

• The "single shift" feed and rapid traverse control (a patented Gray feature) makes it possible to engage or disengage the feed or rapid traverse of the heads in either direction by the flip of a single lever. In these days when women and older men are operating planers, ease and simplicity of control is a vital matter.



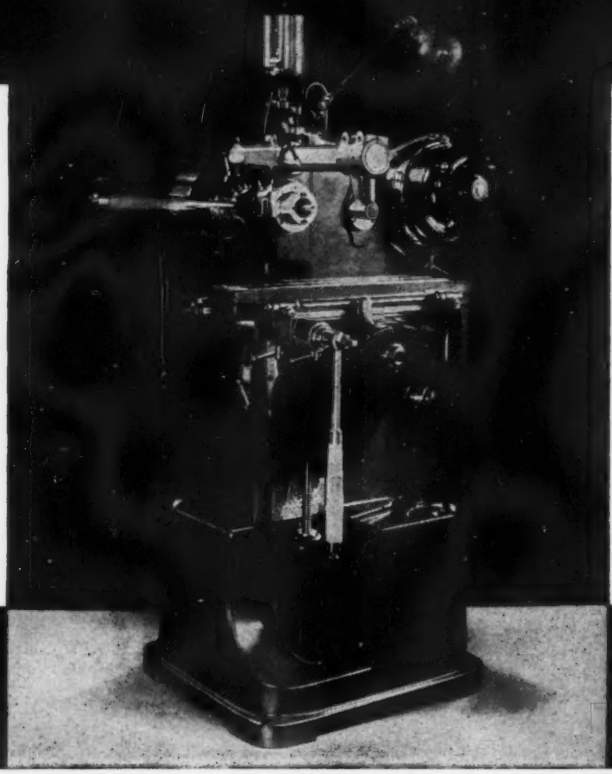
THE G. A. GRAY COMPANY
Cincinnati Ohio, U. S. A.

THE GRAY LINE — Double Housing and Openside Planers, Switch Planers, Die Block Planers, Double-Housing and Openside Milling Planers, Planer Type Milling Machines, Horizontal Boring Machines.

Precision, Sturdiness, High Production and Long Life

are combined in the

NICHOLS HAND MILLING MACHINE



Fast, close work on parts milling is assured by the Nichols Hand Miller. Ruggedness and in-built accuracy place this machine in the class of a modern production tool.

Valuable time savings, especially in tool room service, are offered by the "NICHOLS" because of its compactness and quick, easy set-up. Precision and outstanding versatility contribute also to the adaptability and productivity of this modern machine for tool room use.

An important feature of design which extends the utility and convenience of the Nichols Hand Miller is the vertical head. Operated by hand, the head can be locked in any position. It is also fitted with hand set depth stop. In addition to carrying the spindle, the head supports the heavy overarm for supporting cutting arbor.

Other features of this machine which has longitudinal and transverse feeds of 10″ and 7″ respectively are fully described in bulletin available promptly on request.

Send for Illustrated Bulletin, giving complete information

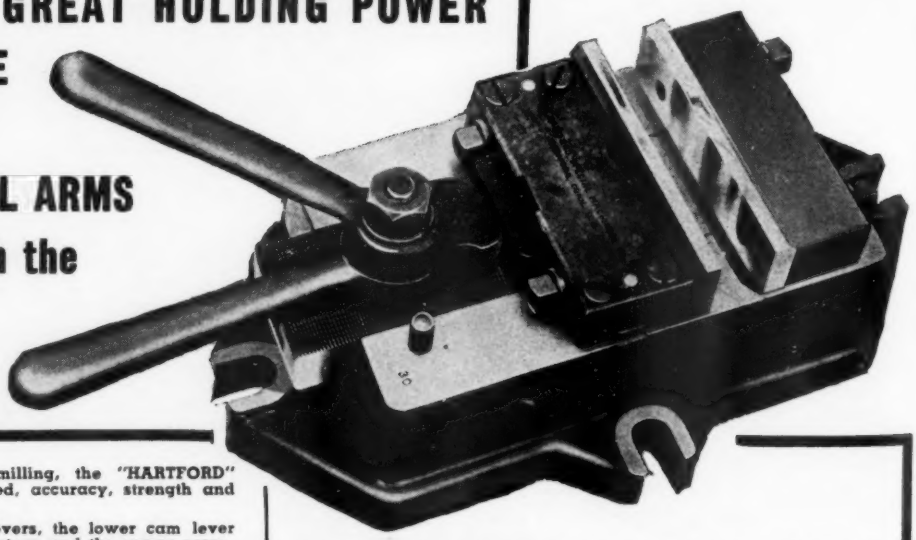
W. H. NICHOLS & SONS

WALTHAM, MASS., U.S.A.

QUICK OPENING, GREAT HOLDING POWER

and **QUICK RELEASE**

assure SPEED and ACCURACY in SMALL ARMS PRODUCTION . . with the "HARTFORD" MILLING VISE



Specially developed for small arms milling, the "HARTFORD" Quick-Acting Vise provides power, speed, accuracy, strength and convenient operation.

All operations are controlled by two levers, the lower cam lever providing for quick opening and quick return and the upper eccentric lever supplying the pressure for holding work. Both levers can be manipulated with one hand. A quarter turn of eccentric binding lever opens movable jaw slightly for chip clearance or for releasing thin work.

Jaw location is a unique feature of the "Hartford," the movable jaw being in the position ordinarily occupied by the solid jaw in the conventional screw type vise. "Hartford" design assures perfect jaw alignment and tremendous strength. Jaws remain parallel regardless of how the work is held.

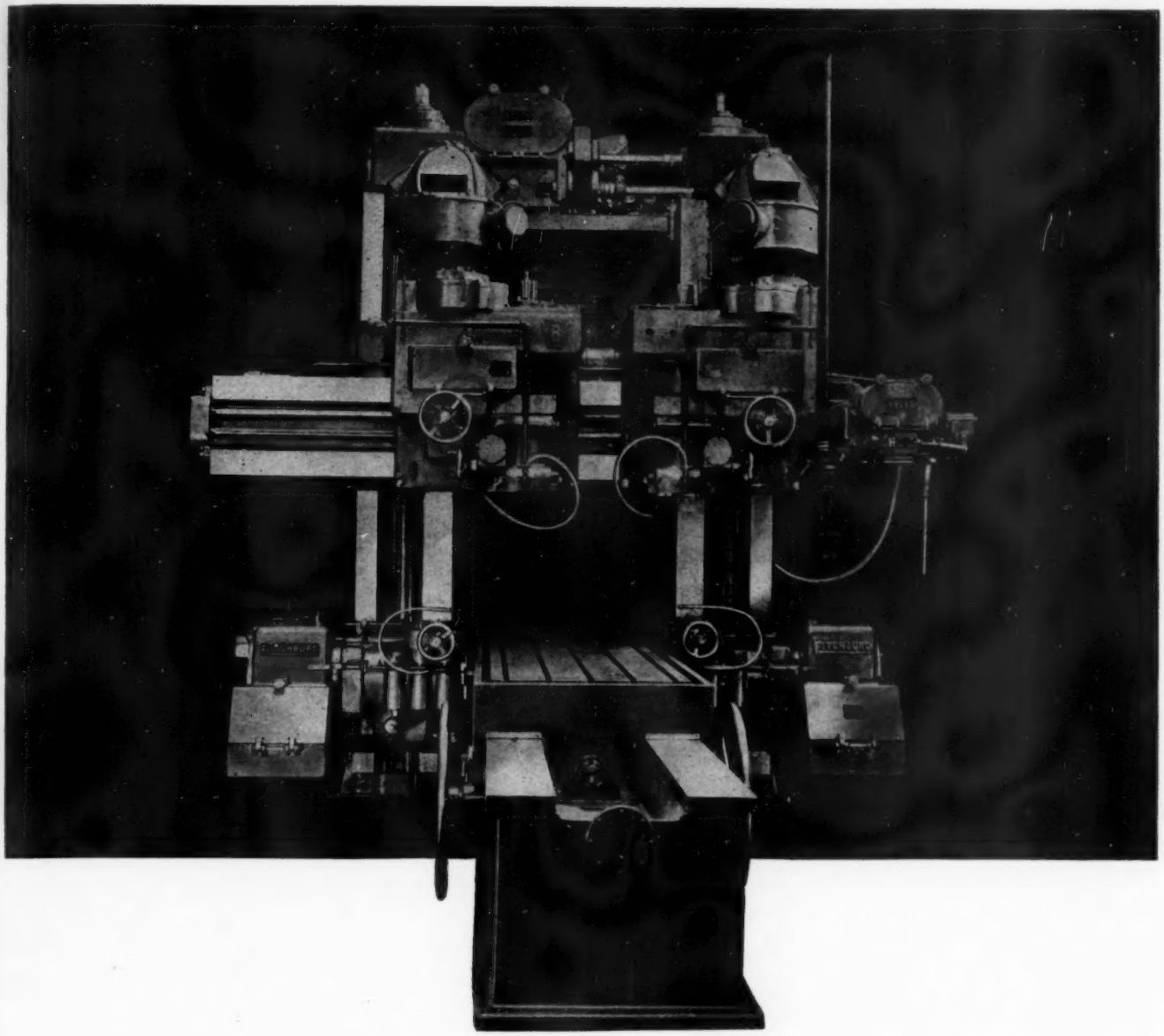
Precision manufacture makes possible the furnishing of accurate, interchangeable parts from stock.

SPECIFICATIONS

Made in Plain and Swivel Jaw Types	Max. opening (Swivel Jaw)—2¼″
Width of Jaw—5″	Weight—40#
Depth of Jaw—1-3/16″	Dimensions (overall) 13″ long—8″ wide—5″ high
Max. opening (Plain Jaw)—2⅝″	

Write at once for complete information.

THE HARTFORD SPECIAL MACHINERY CO. HARTFORD, CONN.



FITCHBURG PLANER TYPE MILLER

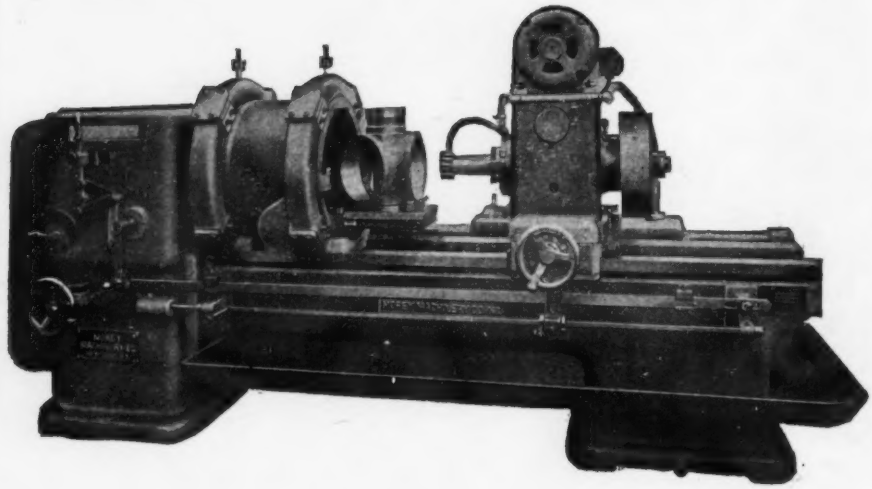
Fitchburg 4-head planer type milling machine equipped with four 5″ milling heads. Width of table 36″, distance between uprights 44″, length of table 12 ft. Feed to table by screw suspended in fully enclosed Timken bearings, driven through mechanical gear box. Heads have feed and rapid traverse horizontally on cross rail and vertically on uprights. Rail has vertical feed and traverse. Rail is hydraulically clamped from operator's position. Six of these machines furnished to a large electrical manufacturer.

FITCHBURG ENGINEERING CORPORATION

FITCHBURG, MASSACHUSETTS

MOREY DESIGNED AND BUILT *For* PRECISION *Plus* PRODUCTION

MOREY-SHIELDS THREAD MILLING MACHINE



Maximum diameter	Distance between centers
12"	60"
12"	90"
12"	120"

Longer beds to order

• Hole through spindle 4 1/16" . . . Headstock—a complete self-contained unit . . . Simplicity in selecting varying cutter speeds and feeds . . . Extra heavy and rigid bed section . . . Motor driven cutter head, fully universal . . . Control—convenient to operator . . . Equally efficient for external or internal thread milling, with either single cutter or a hob.

Ask for Circular No. 737

MOREY MACHINERY CO., INC
410 Broome Street New York, N. Y.

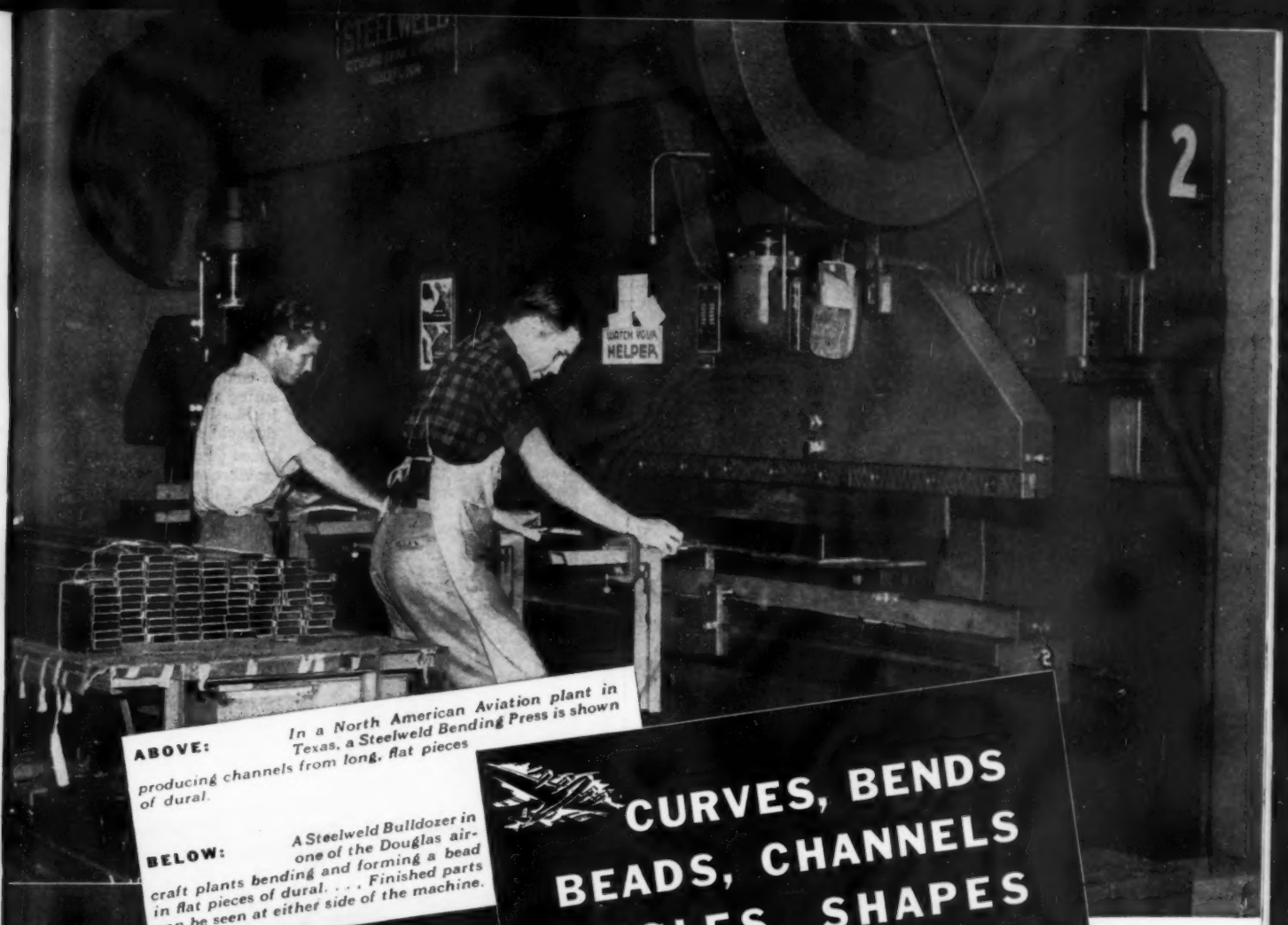
CHASO Threading Tools

IT'S *Chaso* FOR CHASERS!
We make chasers for most of the well-known makes of self-opening die-heads.

• CHASO CHASERS must prove satisfactory in order to fulfill the CHASO guarantee for quality, workmanship and accuracy. It means also that users of CHASO THREADING TOOLS must obtain better service in terms of more threads of closer accuracy between grinds.

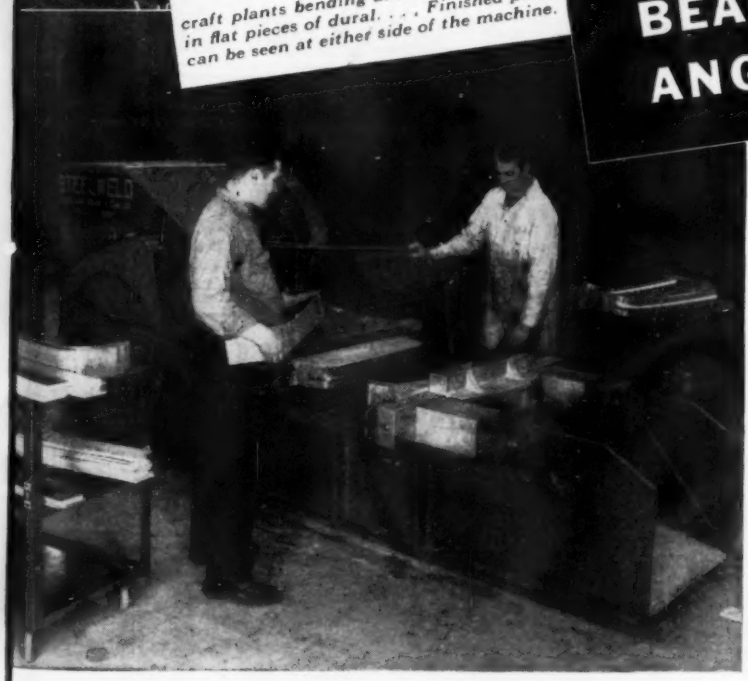
• CHASO production methods assure the satisfactory performance of CHASO CHASERS AND DIE HEADS. Write for our catalog

CHASO TOOL COMPANY, Inc. *Royal Oak, Michigan*



ABOVE: *In a North American Aviation plant in Texas, a Steelweld Bending Press is shown producing channels from long, flat pieces of dural.*

BELOW: *A Steelweld Bulldozer in one of the Douglas aircraft plants bending and forming a bead in flat pieces of dural. . . . Finished parts can be seen at either side of the machine.*



CURVES, BENDS BEADS, CHANNELS ANGLES, SHAPES

STEELWELD Forms Them All for Fighting Planes

In aircraft plants throughout the nation Steelwelds ar speeding the fabrication of parts for every type of plan Complex bends and curves, channels, beads, angles an shapes are quickly produced in dural and other meta measuring up to 20 feet in width. When small quantiti of parts are needed, Steelweld design permits quic change of dies.

Steelweld precision-built presses — powerful, rugge and accurate—are serving the needs of war productic on jobs that range from delicate aircraft operation to th straightening of heavy heat-treated armor plate, performir unfailingly under the severest conditions of consta operation.

GET THIS BOOK!

CATALOG No. 2002 gives complete construction and engineering details. Mail request for free copy.

STEELWELD MACHINERY DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
1127 EAST 283RD ST. WICKLIFFE, OHIO.

STEELWELD
BENDING PRESSES

GENERAL SALES AGENTS: THE CYRIL BATH CO., E. 70TH & MACHINERY AVE., CLEVELAND

The Book of the YEAR!

VICTORY SCREW THREAD
DATA BOOK
With
Foreign and Domestic
THREAD SYSTEMS

CONTENTS

Definitions * Thread Series * Fits (Description) * Marking Symbols * Stockable Chaser Sizes * Coarse Thread Series—Basic Dimensions * Proposed National Extra Fine Thread Series * 27 Pitch Lighting Fixture and Brass Tubing Threads * Fine Thread Series—Basic Dimensions * Tolerances for Screws and Nuts Class 2 and 3 * 8, 12 and 16 Pitch Series * Class 2 Tolerances for Coarse and Fine Thread Series for Screws and Tapped Holes * Tap Drill Sizes for National Coarse and Fine Threads * American National Pipe Threads—Straight Pipe Threads * Acme Threads * Stub Acme * SAE Fuel, Oil and Tube Fitting Thread * Stub 60° Thread * Spark Plug Thread Sizes. British Standard Whitworth * British Standard Fine Thread * British Association Thread * Cycle Engineers Institute Thread * British Standard Pipe—Taper and Straight * International Metric Thread * French Standard Metric Thread * French Standard Thread * Lowenherz Thread—Decimal Inch Equivalent of Millimeters * Equivalent of Metric Pitches in Inches and Threads Per Inch * Three Wire System of Measuring Threads * Decimal Equivalents * Single and Double Depths of American National Whitworth and V Threads Compared * Cutting Speeds—Surface Feet * Weight of Bar Stock Per Foot * Guide for the Design and Purchase of Screw Machine Products * SAE Steels (Analysis) * Important Suggestions on the Design of Threaded Parts.

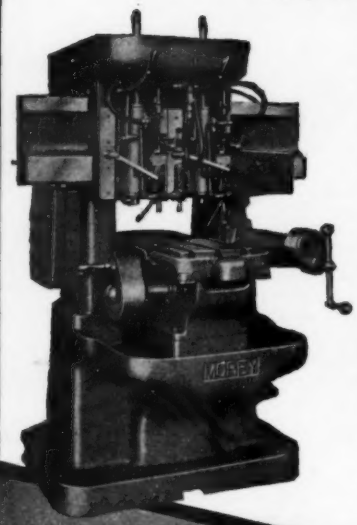
FREE to Factory Executives
who request it on a business letterhead;
others, 15 cents

H&G DIE HEAD

The Eastern Machine Screw Corp.
Manufacturers of H & G Die Heads
20-40 Barclay St. **New Haven, Conn.**

MOREY
DESIGNED AND BUILT
For PRECISION *Plus* PRODUCTION

MOREY VERTICAL PROFILER AND MILLING MACHINE



Over 2000 Morey Profilers in continuous service assuring speedy production for the United Nations in duplicating small parts.

Cross head is balanced on vibration-free cross rail . . . Clearance between spindle and table easily increased or decreased . . . Spindles mounted on precision bearings . . . Ball bearings throughout . . . Slides ride on scraped ways and are adjustable against future wear.

Ample provision for lubrication . . . Simple adjustment takes up backlash . . . No chatter marks on work . . . Table working surface, 12¾" x 15"

Ask for Circular No. 680A

MOREY MACHINERY CO., INC
410 Broome Street New York, N. Y.

For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

Giant KEYSEATERS
MITTS & MERRILL
913 Tilden St.
Saginaw, Michigan

SMITH & MILLS
CRANK SHAPERS
sizes 12" to 32" stroke
THE SMITH & MILLS CO. **Cincinnati, Ohio**

CRAFTS GAGES
Carbide and Diamond-tipped
GAGES AND TOOLS
GUARANTEED QUALITY

ARTHUR A. *Crafts* COMPANY, INC.
Chicago 532 COMMONWEALTH AVE. *Detroit*
Boston

RESCUED

The need for useful tools was never so great. Since you cannot, in many cases, purchase new products — you must conserve what you have. Shortages of materials and labor mean that we must rely, as never before, on our tools and our own mechanical ingenuity.

Covered with dust and rust in the cellars, workshops and factories of America lie millions of dollars worth of potentially useful tools. Most of these could be repaired for a fraction of their original cost.

Individually and collectively, let's put these millions of dollars worth of discarded tools back to work. Prompt action is imperative. Delay now means costly deprivement later.

* * * * * *

H. K. PORTER, INC., manufacturers of metal cutting tools since 1880, offer a practical booklet on the use, maintenance and repair of Porter HKP Cutters and other types of small tools. Send for your copy now. All Porter tools are precision built and like parts are interchangeable.

ARMY-NAVY "E" awarded to our Men and Women for Excellence in War Production

H. K. PORTER, Inc. Everett, Mass.

A.M. 4

Without cost or obligation send me your booklet on the use, maintenance and repair of Porter HKP Cutters

Name _____ Address _____

City _____ State _____

PUT YOUR COLD METAL SAWING ON A LOW COST, HIGH PRODUCTION BASIS.. *with this* NEW PORTER-McLEOD MACHINE

Especially designed for stepping-up speed of cutting stock from 3 inches up, the Porter-McLeod 8" Cold Metal Sawing Machine is a money saver that quickly pays for itself.

Driven by a 5 H. P. enclosed motor and conveniently controlled by push button, this new machine makes big savings on general work or on production work involving single or multiple units. Because of its capacity and upper feed it is possible to "nest" economical quantities of bars and shapes so that several pieces can be cut at one time. The standard 3 inch feed of this machine can be increased for cutting brass and non-ferrous metals.

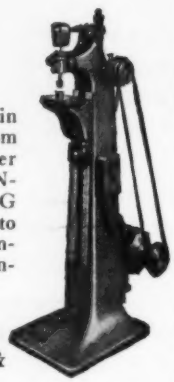
Features which make this machine particularly advantageous for fast accurate production of larger sizes of stock include: support of blade close up to its rim and pulling of blade through the cut, a design which prevents buckling of saw, eliminates weaving, insures maintenance of accuracy and straight cuts; feed is by friction disc which insures against blade breakage especially when hard spots are encountered in the stock being cut.

Get all the details of this new machine by writing *NOW* for descriptive bulletin.

PORTER-McLEOD MACHINE TOOL CO., INC.
HATFIELD, MASS., U. S. A.

MACHINE TOOL COMPANY

GRANT



RIVETERS—PIONEERS in their line—head rivets from smallest to 5/8" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.

THE GRANT MFG. & MACHINE CO.
85 Silliman Ave., Bridgeport, Conn., U. S. A.

BAUMBACH
STANDARDIZED DIE SETS

BETTER-MADE
DIE SETS
AT LOWER COST

46 Styles—195,000 Sizes

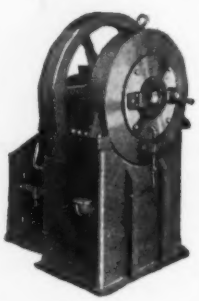
E. A. BAUMBACH MFG. CO.
Machined Steel Semi-Steel
Send for our new catalog
1812 South Kilbourn Ave., Chicago, Ill.

Die-Making Machines

They save 50% on sawing, filing and lapping operations, easily maintaining .002" limits. Ask for special bulletin —also circulars on Drill pointers, Point Thinners, Mill cutter Grinders and Tap Grinders.

OLIVER OF ADRIAN PRODUCTS

Oliver Instrument Co., 1414 Maumee St., Adrian, Mich.



THE
TORRINGTON
ROTARY
SWAGING MACHINE

— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

The Torrington Co., Swager Dept.
56 Field Street Torrington, Conn.

STRAIGHT SIDE SINGLE CRANK PRESSES
for heavy blanking and forming

Heavier classes of blanking and forming work can be handled efficiently and economically on these presses.

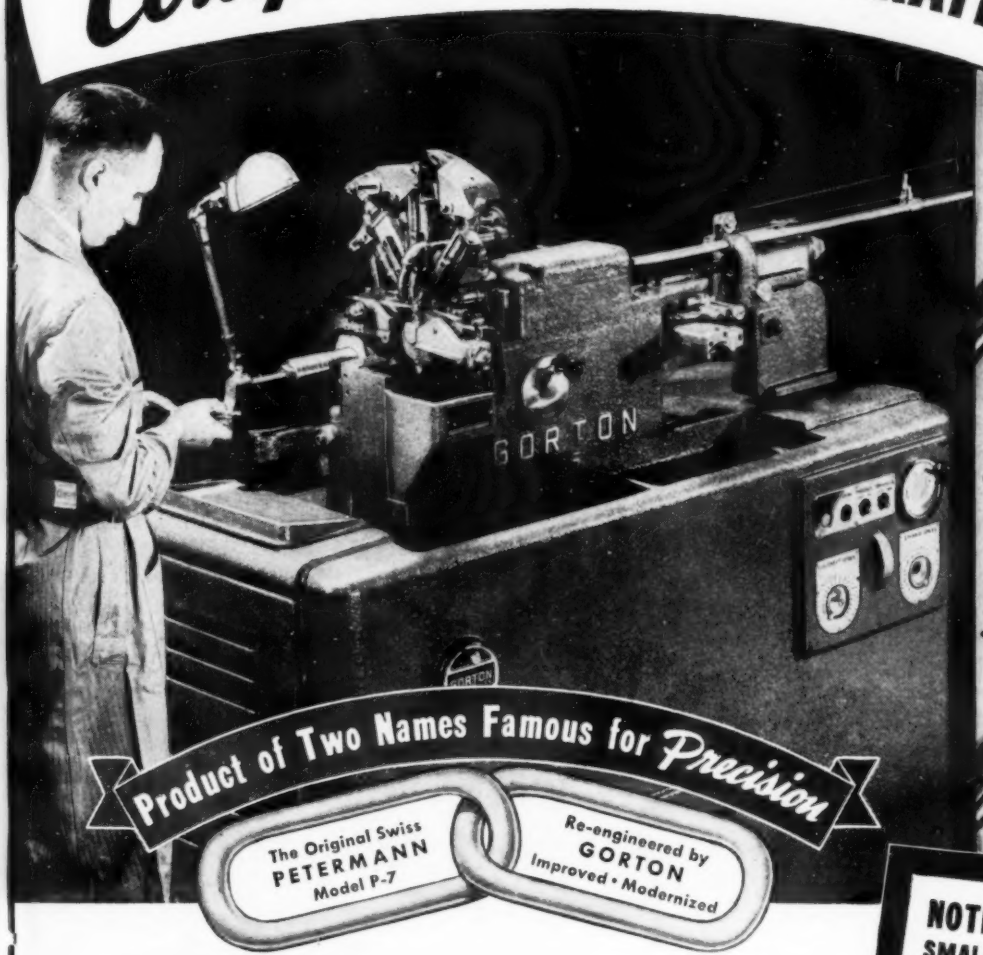
Sturdily constructed with either solid frame or built up with tie rods. Small elastic deflections do not affect tool alignment. All stresses taken centrally. Made also with wedge adjustment for slide for very close work.

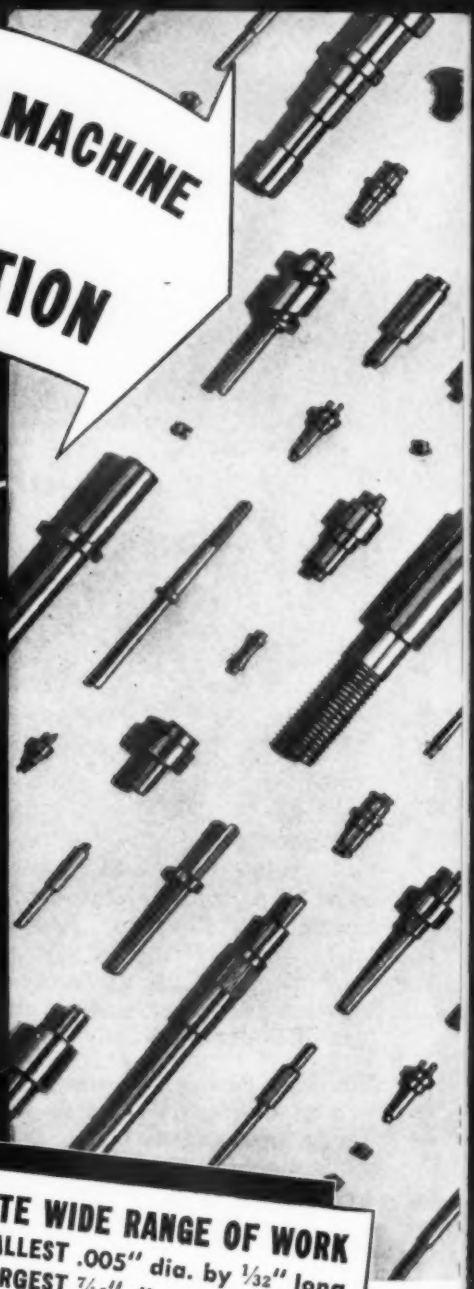
Full details on request.

straight side press

ZEH & HAHNEMANN CO.
180 Vanderpool Street
NEWARK N. J.

NEW *Precision* AUTOMATIC SCREW MACHINE
Solves Tough Jobs Like These...
Complete – IN ONE OPERATION





Product of Two Names Famous for *Precision*

The Original Swiss PETERMANN Model P-7

Re-engineered by GORTON Improved • Modernized

NOTE WIDE RANGE OF WORK
SMALLEST .005" dia. by 1/32" long
LARGEST 7/16" dia. by 2¾" long

PARTS SHO
ACTUAL SI

GORTON ANNOUNCES a new, more versatile Precision Automatic—the Model 16-A Screw Machine. Built to meet America's emergency and post-war critical needs for mass production of extremely small, intricate parts. Long, slender pieces—multiple diameters are finely finished to closer tolerances, in one operation. Unique design offers almost limitless scope in generating any shapes. Present deliveries, 6 to 8 weeks.

Exceptional ACCURACY AND QUALITY OF FINISH

High diametrical accuracy—work rigidly supported at point of cutting tool load. Unusually high finish—grinding often eliminated.

LOW TOOL AND OPERATING COST...

Maximum accessibility for quick set-ups. Uses only standard single point tool bits. Micrometer adjustments on every tool. Centralized controls—infinitely variable speeds and cam feeds at touch of dials.

LONG LIFE OF PRECISION PERFORMANCE...

Slow movements—short stroke—freedom from vibration.

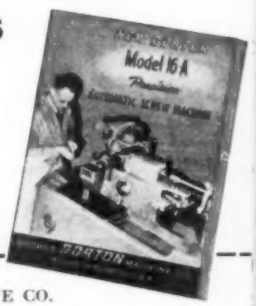
ARMY E NAVY

OUR GOLDEN ANNIVERSARY
1893-1943

GET THE FACTS NOW

Write Today for FREE Bulletin

MAIL TODAY



GEORGE GORTON MACHINE CO.
1315 Racine St., Racine, Wis.

Send me, without obligation, FREE bulletin with complete information covering the Gorton 16-A Precision Automatic.

Name..... Title.....

Company.....

Address.....

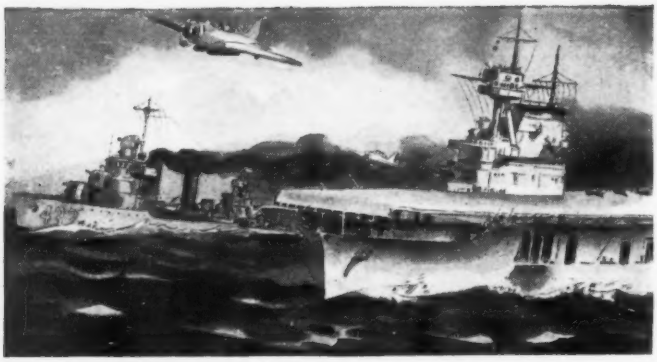
City..... State.....

GORTON 50 YEARS OF PRECISION TOOLS

GEORGE GORTON MACHINE CO

1315 RACINE STREET, RACINE, WISCONSIN, U. S. A.

SPECIALISTS FOR 50 YEARS IN REPRODUCING FROM MASTERS—ENGRAVING, DIE MAKING, VERTICAL MILLING MACHINES



Capacity available NOW for the design and manufacture of automatic machinery

In addition to the volume of Dieing Machines being produced here for the war industries, we are at present engaged in the design and manufacture of various special items for planes, ships and ordnance.

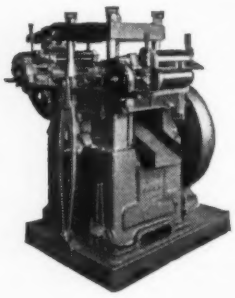
These include intricate jigs, precision parts and subassemblies, and complete machines—for which work we are exceptionally well equipped by experience and facilities. As originators and manufacturers of some of the most prominent automatic machines in the entire war program, we are in a position to attack your problems with vigor and skill. We will work with you on basic designs, on revising machines to fit new applications, or purely on the manufacture of items to already approved specifications.

You will find our engineers exceptionally well informed on the broad war production picture, and firmly grounded in the modern techniques of automatic machinery. State what you have in mind and we will answer promptly.

Manufacturers of the famous Dieing Machine

The Dieing Machine has become famous in the war program because it introduced wholly new standards for producing intricate stamped items COMPLETE PER STROKE to high precision at new high production. Capacities: 10 tons to 300 tons.

REQUEST CATALOG 43



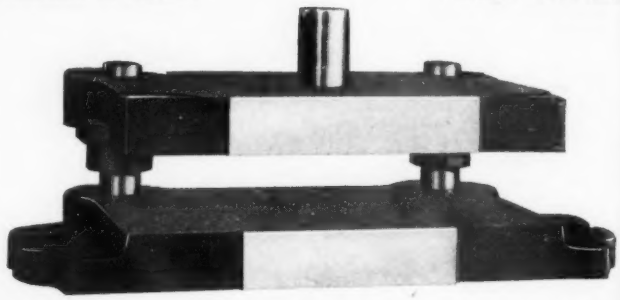
THE HENRY & WRIGHT MFG. CO.
483 Windsor St. Hartford, Conn.

Henry & Wright
AUTOMATIC MACHINERY
DESIGNERS & BUILDERS

DETROIT DIE SETS ★

STANDARD
DIE SETS and ACCESSORIES

SEMI-STEEL o **ALL STEEL**



PRECISION DIE SETS • SPECIAL DIE SETS • DOWEL PINS
SPRINGS • SOCKET-HEAD SET SCREWS • CAP SCREWS

STEEL BOLSTER, STRIPPER AND PRESSURE PLATES
Made to Order — Any Shape — Any Size

Write for Catalog

DETROIT DIE SET CORP.
2895 W. GRAND BLVD. DETROIT, MICH.

DIE HEADS Self-Opening **TAPS** Collapsible

THREADING MACHINES

MURCHEY MACHINE & TOOL CO.
951 Porter St. Detroit, Mich.

DAVIS KEYSEATER

This low cost machine will handle any keyseating job in the shop up to 1 ¼ in.

Write for illustrated bulletin

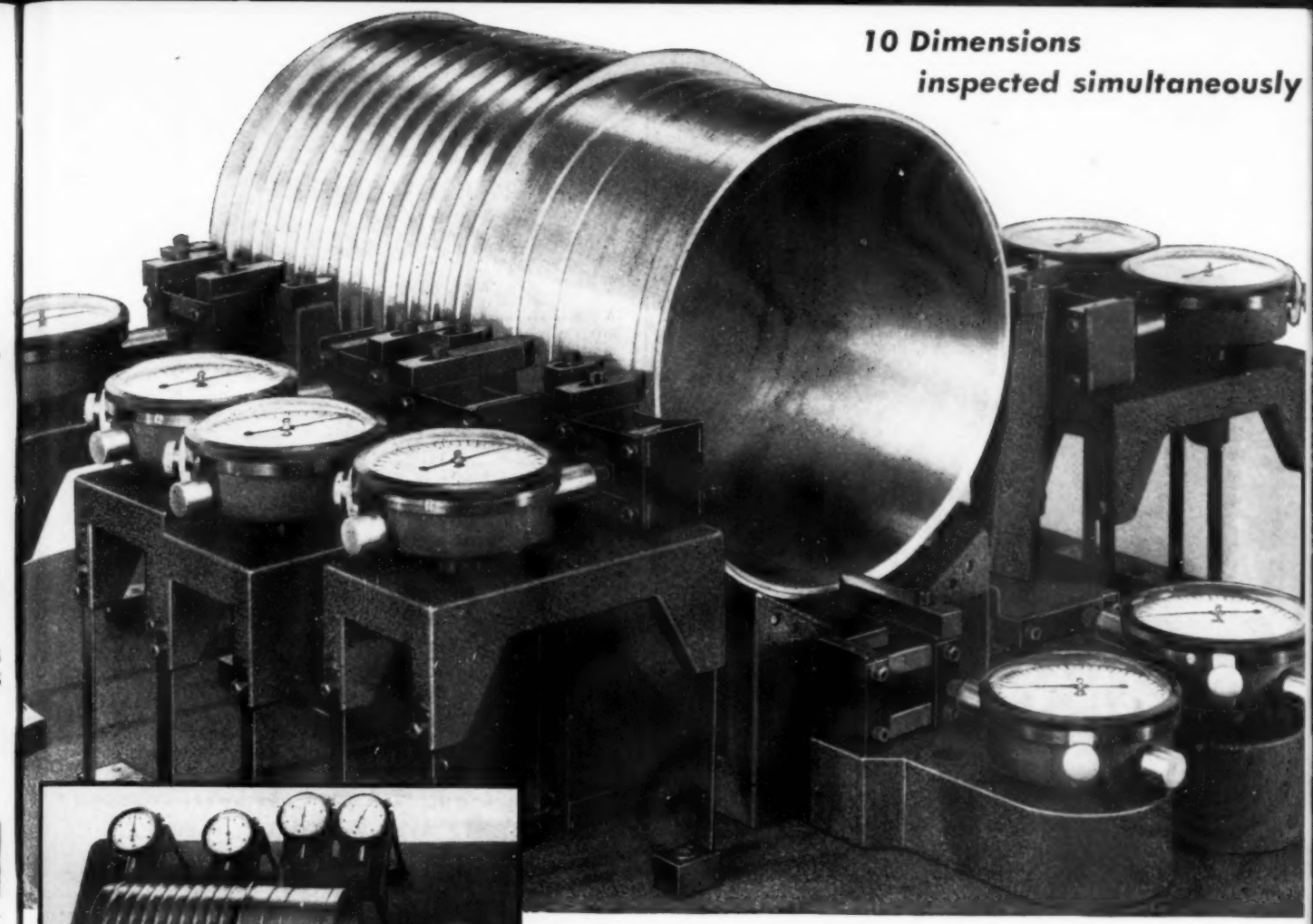
DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

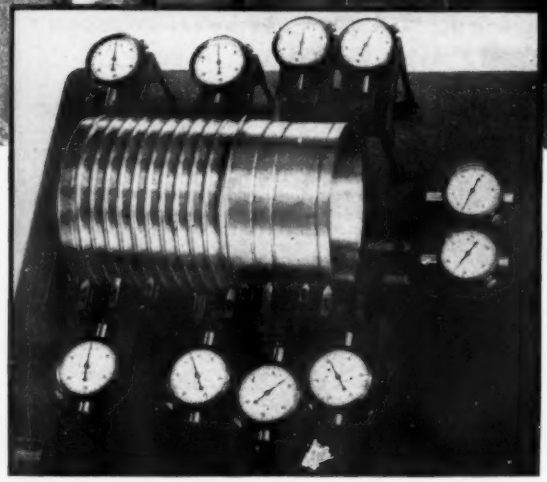
"Ask ETNA about Swaging"

• If you have a production phase that calls for tapering, sizing or reducing of solids or tubes, you can save money if you "ASK ETNA ABOUT SWAGING." The superior performance of ETNA machines assures you more pieces per hour at lower cost. Built in capacities of ⅛" to 4" . . . larger sizes built to order!

Ask for our swaging catalogs

The ETNA MACHINE Co.
3400 MAPLEWOOD AVE. TOLEDO, OHIO





Why don't you use MACHINE GUN methods for inspection . . . . . ?

One-at-a-time inspection of dimensions is only single-shot rifle shooting. The men at the fighting front use faster methods, but ho about you on the home front?

Last year the ten dimensions on the above cylinder were inspected o at a time. Now, they are checked all at once because of Dial Indicat Gage methods.

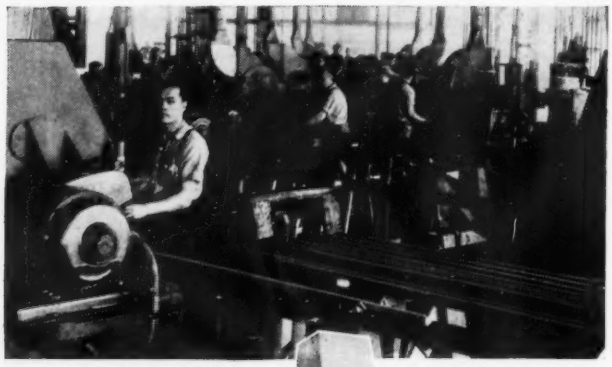
At the left, diameters of a shaft are checked in a fraction of the form time and more positively and more accurately. Investigate this fast, c curate and low-cost method of inspection. Write for more informatic

FEDERAL PRODUCTS CORPORATIO
PROVIDENCE **RHODE ISLAN**

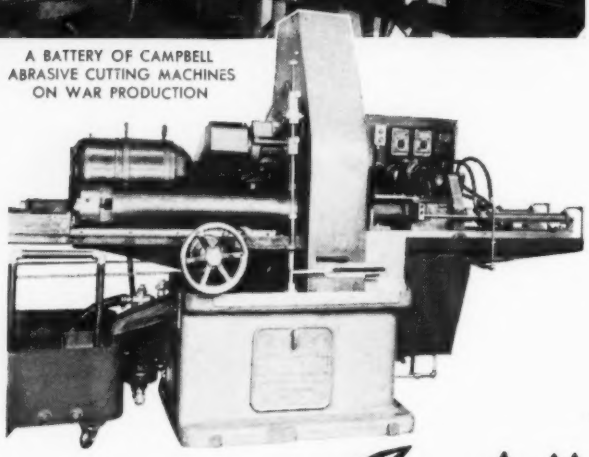
★ ★ ★ ★ ★ **FEDERAL** ★ ★ ★ ★ ★

PRECISION MEASURING INSTRUMENTS

Chicago · Cleveland · Detroit · Hartford · Los Angeles · Milwaukee · Montreal · Indianapolis
New York · Philadelphia · Pittsburgh · Rochester · San Francisco · St. Louis · Toledo · Toronto · Wind



A BATTERY OF CAMPBELL ABRASIVE CUTTING MACHINES ON WAR PRODUCTION



YOU, TOO, CAN GET *Campbell*

ABRASIVE CUTTING MACHINES

TO MEET YOUR SCHEDULES

● Production in the plant pictured above required several different **CAMPBELL** models. Your plant may need only one. The certain way to find out—and get new cost facts on cut-off operations—is to write the Campbell Engineering Department.

State the materials you are cutting—shapes, sizes, lengths before cutting, lengths of cut-off pieces and production required per hours. From this data we will develop production procedures and costs for you.

Remember, **CAMPBELL** has a complete range—the *only* complete range—of **ABRASIVE CUTTING MACHINES** as the foundation for these recommendations, 8 types, 19 models. And they currently are being used on all grades of steel, annealed and unannealed, non-ferrous alloys—solid bar, tubular and flat—and on plastics, glass and ceramics.

Send your data to the Campbell Engineering Department now—no obligation.

Campbell

ABRASIVE CUTTING MACHINES

ALSO MAKERS OF A COMPLETE LINE OF NIBBLING MACHINES

ANDREW C. CAMPBELL DIVISION

BRIDGEPORT • CONNECTICUT

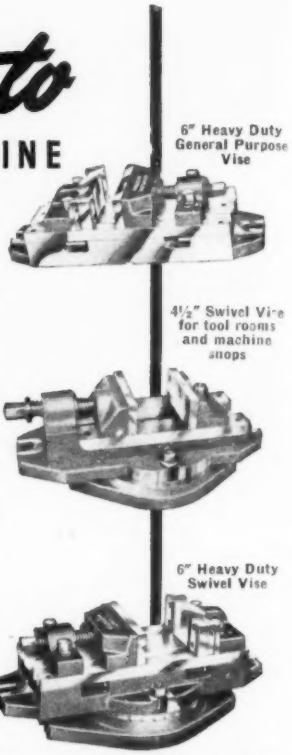
ACCO

AMERICAN CHAIN & CABLE COMPANY, Inc.

BRIDGEPORT • CONNECTICUT

Producto

MODERN MACHINE *Vises*



6" Heavy Duty General Purpose Vise

4½" Swivel Vise for tool rooms and machine shops

6" Heavy Duty Swivel Vise

● There are no Vises that compare with PRODUCTO Vises.

These superior and modern Vises are so much better than the conventional design.

Bodies fitted with hardened and ground wearing plates—extra large opening between jaws—large screw and nut for movable jaw—make these 4½" and 6" Vises practicably indestructible and useful for very long wear.

We also make Cam Lock Vises in 4", 5" and 7" sizes for production milling and drilling operations. Best vise for this purpose.

Don't bother with old tools—use Modern Machine Vises.

Ask for 8-page circular—

Also manufacturers of Producto Die Sets and Die Makers' Accessories.

PRODUCTO

The

PRODUCTO MACHINE COMPANY

940 HOUSATONIC AVE. BRIDGEPORT, CONN.

3017 MEDBURY, DETROIT, MICH.

ACCURACY

ATOMETRIC GAGE BLOCKS

PERFECTION IN MEASUREMENT MEANS PERFECTION IN YOUR PRODUCT

ATOMETRIC PRECISION GAGE LABORATORIES, Inc.

STAMFORD, CONNECTICUT, U. S. A.

BRIDGEPORT "ABRASAW"

Wet Cut-Off Machines are MODERN and MONEY SAVING

They do a Real Job. Ample power. Good clean cut, without heating the metal. Two sizes, for solids up to 2½" and tubing up to 3½".

Send for Descriptive Circulars

BRIDGEPORT

Safety Emery Wheel Co., Inc.

1286 W. BROAD ST.

BRIDGEPORT CONN.

STYLE as well as SAFETY for Women Welders

HAT CREATED BY JOHN FREDERICS ... CLOTHING CUT FROM DRESSMAKER PATTERNS

AO Tailored Sleeves and Tailored Overalls. Also available: Tailored Cape Sleeves and Bib, and Tailored Aprons.

AO Tailored Coat. Also available: Tailored Short Jackets and Gloves and Mittens.

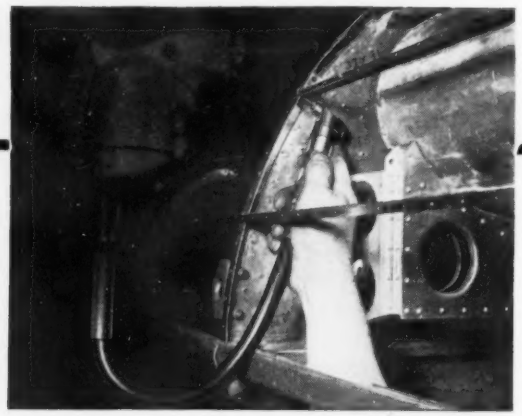
Follow the line of least resistance — the AO line of tailored protective clothing for women welders. Every garment is made of specially selected chrome tanned cowhide, tailored to provide comfort, flexibility, and freedom of movement. The leather is as light in weight as is consistent with safety—available in rich brown or natural gray.

John Frederics designed the hat — a jaunty creation that holds the hair snugly in place and protects hair and ears from flying sparks — available in rich brown or natural gray leather, or cassimere. Get in touch with your nearest American Optical Company branch for complete details.

American Optical COMPANY

SOUTHBRIDGE, MASSACHUSETTS

ANSWER TO AWKWARD DRILLING!



It's Easy with STOW

STOW FLEXIBLE DRILL-SHAFTS

. . . for Tight Spots

Many a busy production line gets bogged down with wasted time on Close-Quarter Drilling—which can easily be eliminated just by attaching a STOW Flexible Drill-Shaft to your electric hand-drill. You can then drill within ¼″ of angle corners . . . get around all sorts of obstructions and still maintain accurate location of the hole. This amazingly versatile tool requires only one-handed operation—and either the Park 90° Head or 45° Head with Offset Spindle does the job. For heavier work, a 90° Head with direct-geared spindle may be used.

The handy, quickly-attached STOW flexible Drill-Shaft fits into your drill-chuck with a permanent grip; the strong, long-lasting core gives maximum flexing and angularity for hard service; the rugged case provides full protection! STOW—the pioneer of flexible shafting—is ready to send you full information on these valuable shop accessories—made as only 68 years of experience can make them. Write us today!

TAKES THE TOOL RIGHT TO THE JOB

For grinding, sanding, wire-brushing, drilling, buffing, polishing or filing — *anywhere in the plant* — you can't beat the convenience and efficiency of STOW Flexible Shaft Machines. A STOW unit cleans up in a hurry on pinch-hit work, rush repairs, toolroom jobs, or parts assembling. STOW is the "one best Tool" that saves you money on a score of different operations!

STOW

MANUFACTURING CO.,
29 Shear St., BINGHAMTON, N. Y.

For Better Uniforms Demand These Labels!

ARMY TWILL "REEVES" SANFORIZED* MADE TO GOVERNMENT SPECIFICATIONS

REEVES Glengarrie POPLIN

REEVES ARMY TWILL SCORES A HIT!

With men who handle machinery, it's stamina and wear that count in uniforms. So specify this famous fabric when ordering your uniforms.

Reeves Army Twill passes U. S. Govt. tests for strength, endurance and color-fastness. For fabric vitality it's a leader.

For matching shirts, GLENGARRIE POPLIN is equally popular. Both fabrics available in favorite colors — are Sanforized* against shrinking.

*Fabric shrinkage not more than 1%. (U. S. Government Test CCC-T-191-a)

See your nearest dealer for uniforms, sport and work clothes made from these famous fabrics, or write for leaflet to:

OVER 60 50 million yards of Reeves Army Twill sold to the U.S. Army

REEVES BROTHERS, INC.
54 WORTH STREET NEW YORK

NEED SUB-CONTRACTS?

Investigate the possibilities offered you through the CONTRACT WORK SECTION!

For details, write

CONTRACT WORK DEPT.
American Machinist 330 W. 42nd St., N. Y. C.

LUERS

Patented Cutting Off Tool Holders
Patented Cutting Off Blades

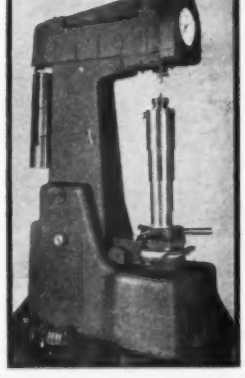
ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

Manufactured By
J. Milton Luers — 12 Pine St. — Mt. Clemens, Mich.
Produced under License Issued by John Milton Luers Patents Inc.

"ROCKWELL"

HARDNESS TESTER

BETTER and BETTER
EACH YEAR
SINCE 1921



WILSON

MECHANICAL INSTRUMENT CO., INC.
Concord Ave. New York

LAST YEAR'S BONDS GOT US STARTED

THIS YEAR'S BONDS

ARE TO WIN!

★ Last year saw nearly 30,000,000 workers voluntarily buying War Bonds through some 175,000 Pay-Roll Savings Plans. And buying these War Bonds at an average rate of practically 10% of their gross pay!

This year we've got to top *all* these figures—and top them handsomely! For the swiftly accelerated purchase of War Bonds is one of the greatest services we can render to our country . . . and to our own sons . . . and our neighbors' sons. Through the mounting purchase of War Bonds we forge a more potent weapon of victory, and build stronger bulwarks for the preservation of the American way of life.

"But there's a Pay-Roll Savings Plan already running in my plant."

Sure, there is—but how long is it since *you've* done anything about it? These plans won't run without winding, any more than your watch! Check up on it today. If it doesn't show substantially more than 10% of your plant's pay-roll going into War Bonds, it needs winding!

And you're the man to wind it! Organize a vigorous drive. In just 6 days, a large airplane manufacturer increased his plant's showing from 35% of employees and 2½% of pay-roll, to 98% of employees and 12% of pay-roll. A large West Coast shipyard keeps participation jacked up to 14% of pay-roll! You can do as well, or better.

By so doing, you help your nation, you help your workers, and you also help yourself. In plant after plant, the successful working out of a Pay-Roll Savings Plan has given labor and management a common interest and a common goal. Company spirit soars. Minor misunderstandings and disputes head downward, and production swings up.

War Bonds will help us win the war, and help close the inflationary gap. And they won't stop working when victory comes! On the contrary—they will furnish a reservoir of purchasing power to help American business re-establish itself in the markets of peace. *Remember, the bond charts of today are the sales curves of tomorrow!*

You've done your bit Now do your best!

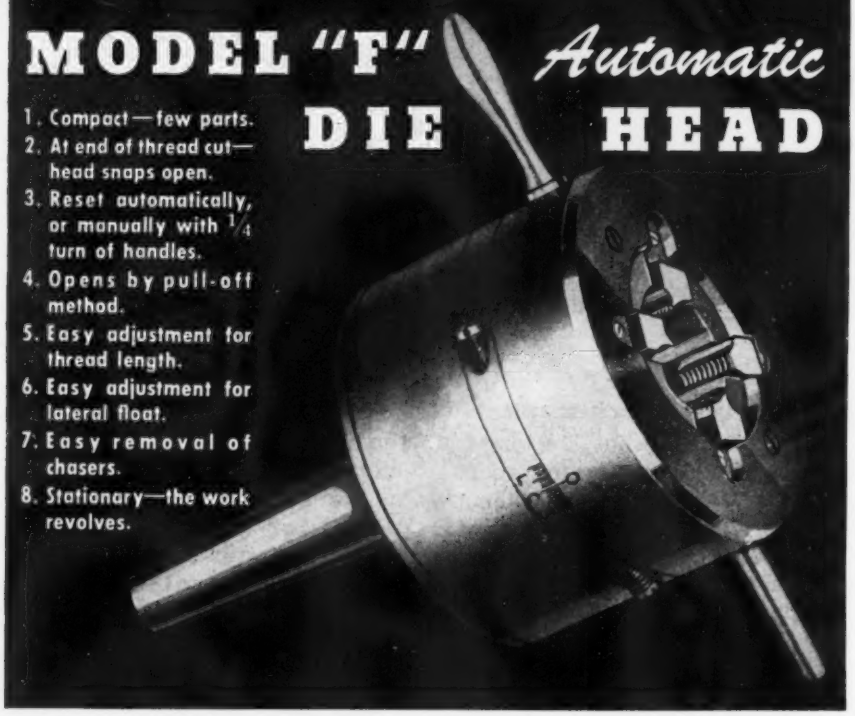
THIS SPACE IS A CONTRIBUTION TO AMERICA'S ALL-OUT WAR EFFORT BY

AMERICAN MACHINIST

Rickert Shafer

FOR 35 YEARS

MODEL "F" Automatic DIE HEAD



1. Compact—few parts.
2. At end of thread cut—head snaps open.
3. Reset automatically, or manually with 1/4 turn of handles.
4. Opens by pull-off method.
5. Easy adjustment for thread length.
6. Easy adjustment for lateral float.
7. Easy removal of chasers.
8. Stationary—the work revolves.

R-S, for over 35 years has stood for Rickert-Shafer, and precision threading equipment. Over the years we have concentrated most of our attention on second operation tools, Die Heads of all kinds, Collapsible Taps and Boring Heads. We have found time to design and build thousands of Friction-type Tapping Machines and hundreds of special designed-for-the-job Threading Machines. What is your production threading problem? Write today.

RICKERT-SHAFER CO · ERIE, PA.

DIE HEADS • COLLAPSIBLE TAPS • BORING HEADS
TAPPING MACHINES • SPECIAL THREADING MACHINES

STATE

BORING AND REAMING BARS

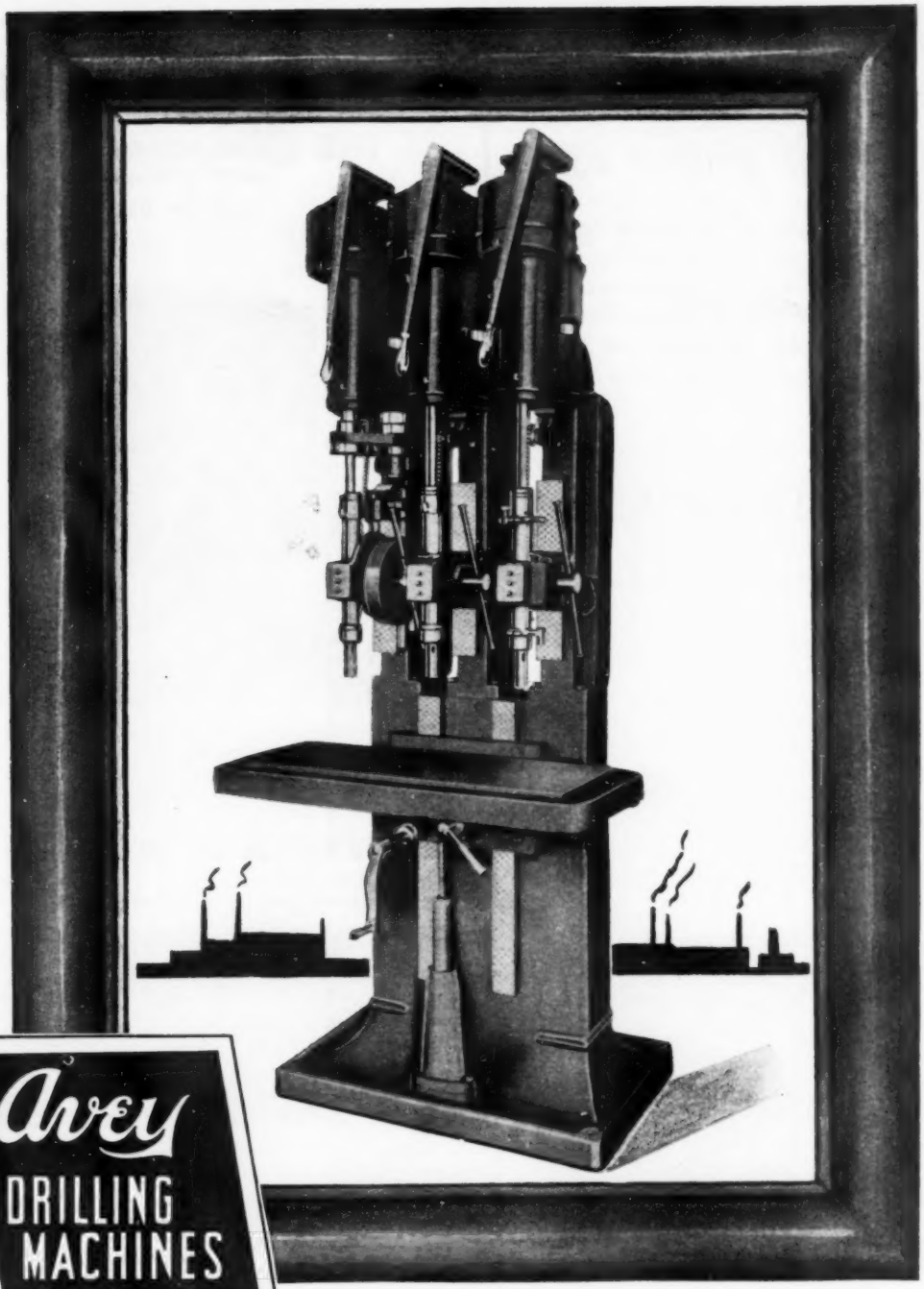
a new tool that sets a new standard for high-speed high quality boring and reaming

● **PRODUCTION MEN** everywhere are finding that **STATE** Boring and Reaming Bars with their exclusive multiple cutter adjustable heads that are capable of **EXPANDING** and **RETRACTING** with a range unequalled on other tools, are giving them **LOWER COSTS PER HOLE** and **INCREASED PRODUCTION.**

STATE Tools are also emergency "must" tools for every tool room. Seven standard sizes will cover ***all*** diameters from 7/8" to 5 1/2". Also special bars to meet individual requirements. **AVAILABLE WITH HSS,** Cast alloy or tipped bits. Designed with pilots, collars, wear strips, etc. to meet customers specifications.

PROMPT DELIVERIES

STATE
MANUFACTURING & CONSTRUCTION CO.
FRANKLIN . . . OHIO



Avey
DRILLING
MACHINES

. . . in the picture for 1943

Make sure it is in your production line for 1943. Avey Drilling Machines give longer operating hours, smoother performance and lower maintenance. They'll do your war job now, your peace job later. We illustrate the Avey Type MA-6 in No. 2 size *(Capacity in cast iron, 7/8")*. No. 3 size *(Capacity in cast iron, 1 1/4")*. One to six spindle units, either size. Six speed machine, two speed motor, three mechanical changes through gearing, 8 to 1 speed range. Push button control. MA-6 illustrated, has three spindles, the Aveymatic Feed, Hand Feed and Tapper.

AVEY DRILLING MACHINE CO.
CINCINNATI, OHIO, U. S. A.

CINCINNATI · OHIO

Avey DRILLING MACHINES

Do you know gages and their proper use?

What is the proper kind of gage for a specific type of work? How are gages constructed? How are they used? Fred Colvin, out of his wide and intimate experience, has set down in a practical, workable manual the essential facts about gages of all types—how they are made, how to use them, which types are best for specific jobs, how to use them in inspection work.

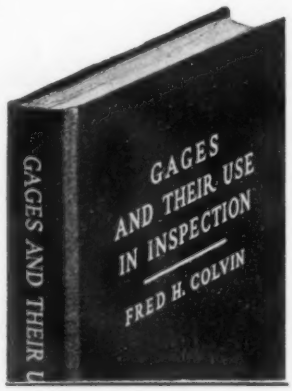
Gages and Their Use in Inspection

By Fred H. Colvin
Editor Emeritus, *American Machinist*
157 pages, 5⅛x8, 71 illustrations, $1.50

This book describes all types of gages, from calipers, Verniers, Micrometers, Measuring Blocks, etc., up to the latest electrolimit gages. Tolerances, limits, and allowances are carefully defined and explained, and many practical kinks and suggestions on inspection are included.

Here is what the book covers—

1. Gages and How They Are Used
2. Measuring Instruments In Common Use
3. Types of Gage
4. Gage Tolerances and Gage Wear
5. Gage Blocks and Dial Gages
6. Reed and Air Gages
7. Threads and Thread Gages
8. Special Types of Gages
9. Interchangeable Manufacture and Inspection
10. Salvaging and Selective Assembly
11. Kinds of Fit



"A thorough understanding of gages and their use will make it easier for both workmen and inspectors, and it may easily open the way for a workman to graduate from the machine to the inspection department."

SEE IT 10 DAYS FREE—MAIL THE COUPON

McGRAW-HILL ON-APPROVAL COUPON

McGraw-Hill Book Co., Inc., 330 W. 42nd St., N. Y. C.

Send me Colvin—Gages and Their Use in Inspection for 10 days' examination on approval. In 10 days I will send $1.50 plus few cents postage, or return book postpaid. (We pay postage on orders accompanied by remittance.)

Name .....

Address .....

City and State .....

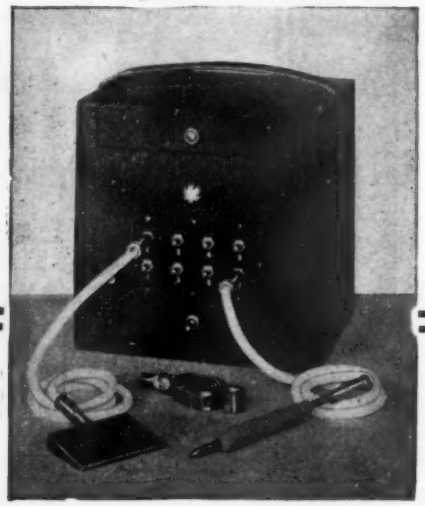
Position .....

Company .....A. 4-29-43

Why Not Buy the Original Electric Etcher?

MARK IRON and STEEL THE Etchograph WAY

3000 IN USE



Mark parts in process, tools, dies, gages and fixtures of any ferrous metals including the hardest alloys and carbides—quickly—plainly.
Three sizes to meet all requirements.

Write for circular and prices

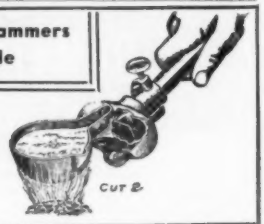
BREWSTER-SQUIRES & CO.
Hudson Terminal Bldg. New York, N. Y.

PRESSES
FEEDS
AUTOMATIC EQUIPMENT
THE V & O Press Co., Inc.
HUDSON, N. Y.

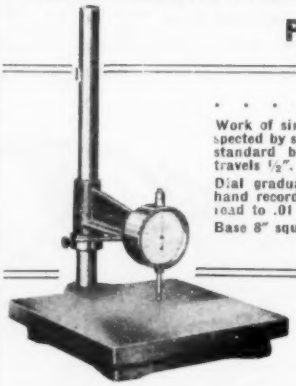
Remelt and Cast Your Lead Hammers with the Field Mould and Ladle

Save time and money—keep lead hammers in good condition at all times—easy to use—fast. Made in 7 sizes for hammers from 1 to 11 lbs. Write for details.
Also, Lead Hammers, sizes 1 to 15 lbs. always in stock.

JOHNSON TOOL CO., INC.
East Providence Rhode Island, U.S.A.



The RANDALL & STICKNEY Platform Gauge



. . . . takes work up to 7 inches

Work of similar size can be quickly and easily inspected by setting gauge head at desired height with standard block or plug. Spindle on gauge head travels ½".

Dial graduated 0 to 50 in. thousandths; second-hand records 10ths of inches. Can be furnished to read to .01 mm.

Base 8" square; height 13"; weight 18½ lbs.

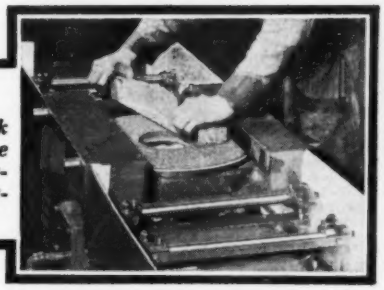
Investigate Now!!

RANDALL & STICKNEY
Waltham, Mass.

They Won't Ration Ingenuity . . .

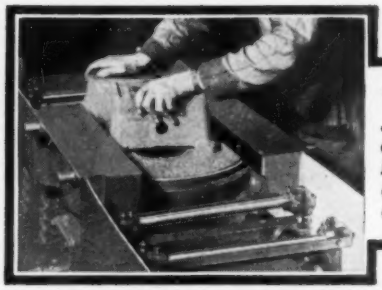
. . . because that's the one thing American industry has plenty of. Many manufacturers have found any number of new uses for the LEMPCO WET SURFACE GRINDER on *high speed* war production jobs. Women operate it easily. Weight of job is carried on guide rollers—and there's *no set-up* required. 5 horse motor; positive gear-type coolant pump; exclusive Lempco micrometric Wheel Dresser assures perfect grinding always. 30 day delivery!

WET SURFACE GRINDER



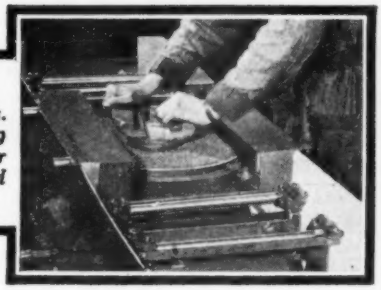
GUIDE ROLLERS . .

. . . make light work of heavy jobs. It's the ideal disc type wet surface grinder for snagging long castings.



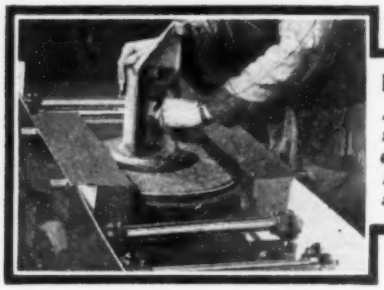
187 SQ. INCH . .

. . . grinding surface produces commercially perfect finishes on softest aluminum or hardest alloys.



GRIND ANGLES . .

. . . at production speeds. Universal work-holding fixture available for grinding at desired angles.



NO WARPAGE . .

. . . because coolant dissipates heat. Eliminates dust. Prevents distortion. Keeps wheel clean and sharp.

LEMPCO

5708 DUNHAM ROAD
BEDFORD, OHIO • U.S.A.

WANTED

MECHANICAL ENGINEER

for Forge Plant
and machine shop

ASSISTANT WORKS MANAGER

for Forge Plant

FOREMEN

for Forge Plant

Must have thorough experience in forge plant operations. These are permanent positions with good salaries and excellent futures for capable men. Give full details of experience, education and personal data. Address:

Personnel Director

TUBE TURNS

Incorporated

224 E. Broadway
LOUISVILLE, KY.

MACHINE SHOP FOREMAN

Must Have A1 Experience

Must be able to set up milling machines, lathes, screw machines, plan and lay out work. This includes supervising shop of thirty-five men.

STEADY WORK
$7,500 YEAR
Location — Manhattan
ONLY U. S. CITIZENS
not engaged at full skill in war work.
WRITE, GIVING ALL DETAILS

P-564, American Machinist
330 W. 42nd St., New York City

Executives, Engineers, Chemists and Metallurgists!

Qualified men wanted for openings throughout the United States. Write for application, or submit experience record.
Inquiries solicited from responsible employers. All negotiations confidential. Est. 28 yrs.

HARRISON PERSONNEL SERVICE
20 W. Jackson Blvd. CHICAGO

PROFESSIONAL SERVICES

BRIGGS-EVANS
Engineering Consultants
Specialists in Design & Methods
High Production
Dies, Tools, Jigs, Special Machines
We know how best to do
what you would like to do
60 STATE ST., BOSTON, MASS.

Tool & Die Makers
Automatic Screw Machine Set-up Man
Sheet Metal Layout Men
GOOD OPPORTUNITY
for Brooklyn War Plant

Write, P569, American Machinist,
330 West 42nd St., New York, N. Y.

POSITIONS VACANT

These Positions Vacant advertisements are published subject to agreement by the advertisers not to consider applicants now employed on war work unless they obtain written release from present employer.

WANTED: A competent machine shop general foreman by plant located in an industrial city in East Tennessee and doing general jobbing and building special machinery. Plant operates own foundry, machine shop, and pattern shop. Offers splendid opportunity for rapid advancement. None but a man of highest qualifications need apply. P-558, American Machinist, 520 N. Michigan Ave., Chicago, Ill.

WANTED: First class engineer experienced in machine tool design; practical experience desired. For man who can assume responsibility this is a good opportunity now and after war with leading machine tool builder. P-559, American Machinist, 330 W. 42nd St., New York, N. Y

WANTED: First class practical machine tool designer by leading machine tool builder. This is good opportunity now and after war for man who can assume responsibility. P-560, American Machinist, 330 W. 42nd St., New York, N. Y.

TOOL ENGINEER, must have experience designing Self Opening Die Heads, Collapsible Taps, and Threading Tools and thoroughly familiar and capable of working out new developments these tools. Good opportunity with old established concern. P-570, American Machinist, 330 W. 42nd St., New York, N. Y.

WANTED: Experienced carbide man thoroughly familiar with carbide tooling and grinding for established company. P-574, American Machinist, 520 N. Michigan Ave., Chicago, Ill.

STRESS ANALYST—Experienced for senior and junior stress analyst work on aircraft engineering contract. Must have aircraft background and experience on aircraft work. P-575, American Machinist, 330 W. 42nd St., New York, N. Y.

EMPLOYMENT SERVICE

SALARIED POSITIONS — This advertising service of 33 years' recognized standing negotiates for high salaried supervisory, technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission. Retaining fee protected by refund provision. Identity covered and present position protected. Send for details. R. W. Bixby, Inc., 266 Delward Bldg. Buffalo, N. Y.

POSITIONS WANTED

EXECUTIVE—technical graduate. Thirty-five years experience in product design, tools, production and sales. Can provide designs for volume product for post war business. Soon at liberty. PW-556, American Machinist, 520 N. Michigan Ave., Chicago, Ill.

COMPETENT AMERICAN engineer with broad experience in product design and production engineering for low costs and high production. Age 57. Salary $8,000. Can organize, supervise, and train others. PW-561, American Machinist, 330 W. 42nd St., New York, N. Y.

WORKS MANAGER: 21 Years experience, Design — Engineering — Production — Pumps — Compressors — Refrigeration — Chemical Apparatus — Power Plants — Steel Fabrication — Material Handling Industrial Engineering — Plant Layout — Special Production Machinery. Age 42, married, 1 child. Location: Preferably West Coast, but will consider other. PW-571, American Machinist, 68 Post Street, San Francisco, Calif.

MACHINE TOOL SALESMAN with many years machine shop and sales experience — also catalogue composing desires position in Connecticut. PW-572, American Machinist, 330 W. 42nd St., New York, N. Y.

POSITIONS WANTED

MATERIAL CONTROL SUPERVISOR — Twenty years experience. Forty-five years old. Have thorough knowledge of production and cost. PW-573, American Machinist, 520 N. Michigan Ave., Chicago, Ill.

SELLING OPPORTUNITIES

OFFERED—WANTED

Selling Agencies—Sales Executives
Salesmen—Additional Lines

OPPORTUNITY OFFERED

MECHANICAL ENGINEER for a manufacturer of precision gears. Must have long selling experience in the same line. Write full details outlining educational background, names and addresses of former employers, territory covered. Exceptional opportunity for well qualified man. SW-539, American Machinist, 330 W. 42nd St., New York, N. Y.

OPPORTUNITY WANTED

LINES WANTED BY Engineering Sales Organization. Established sales company, main office in Chicago with large engineering sales staff, highly organized specialty department, and unusual record in selling to industry, wants lines such as tools, accessories, measuring instruments, welding devices, handling equipment, etc., for distribution in Northern Illinois, Northern Indiana, Wisconsin, and Iowa. Especially equipped to distribute products requiring individual emphasis. W-563, American Machinist, 520 N. Michigan Ave., Chicago, Ill.

PATENT ATTORNEYS

PATENTS, COPYRIGHTS. Booklet, "General Information Concerning Inventions and Patents" and "Fee Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 453, 815-15th St., N.W., Washington, D. C.

CONTRACT WORK

WORK WANTED — For advertisements of work wanted see opposite page.

SALES ENGINEER

With established Honolulu offices, desires to represent a limited number of reputable manufacturers, upon a direct factory representative's basis in the sale of Machinery & Equipment and Supplies in the Pacific Islands; is well acquainted and has excellent sales record in this islands; will arrange preference ratings and M6S permits; offers intensive effort and complete coverage with services continuing on through post-war era. Upon request, details of working arrangement will be submitted to those manufacturers who may wish to follow present trend in establishing factory representation in the Pacific Area.

RA-568, American Machinist
68 Post St., San Francisco, Calif.

THE NICHOLS TABLE OF SCREW THREADS AND TAP DRILLS
$1.75

Now is the time to order your copy. One table, 60 PAGES long, listing all standard screw threads with essential thread data.

THE NICHOLS CO. 1213-K ST. S.W., CEDAR RAPIDS, IOWA

WANTED

LATHE

14" x 6' bed American
all geared head engine Lathe complete with motor and controls and accessories. Must be in good condition and not over 5 years old.

ELDRIDGE W. BURFORD
4401 Venable Ave. S.E. Charleston, W. Va.

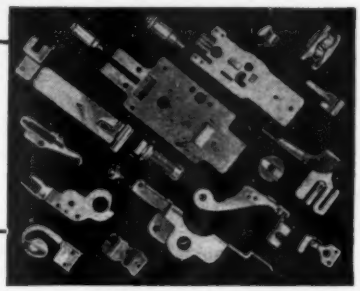
NEW INVENTIONS WANTED

Mechanical and electrical devices which can be used to promote our war production program. Either new ideas, or improvements upon present methods.

P. O. Box 217, Denville, N. J.

CONTRACT WORK

STAMPINGS AND ASSEMBLIES
IN ALL KINDS OF METALS



Fast and efficient service on long or short runs is guaranteed by our modern equipment and methods, backed by 50 years of experience.

We also offer facilities for the manufacture of screw machine products, tools, dies, jigs and fixtures.*

Quality work by skilled mechanics is assured. Send your blueprints or samples today!

"GREATER SAVINGS WITH GREIST"

THE GREIST MFG. CO.
546 BLAKE ST. NEW HAVEN, CONN.

ESSEX MACHINE WORKS
ESSEX, CONN.

•

Contract Manufacturing and Industrial Machine Work

•

Producing For War
Planning For Peace

• Machines and Parts, • Special Tools and Fixtures, • Cam Milling, on Contract

Your engineering problems will receive efficient and economical service in our modern plant manned with skilled workers. Contact us today for prompt quotations on your blueprints or samples.

Designers and builders of wire and ribbon stock forming machines.

THE A. H. NILSON MACHINE CO., BRIDGEPORT, CONN.

WIRE AND METAL SPECIALTIES
In round, flat, square and special shaped wire in all metals.
LARGE PRODUCTION CAPACITY
Plating and finishing.
EASTERN TOOL & MFG. CO.
BLOOMFIELD, N. J.

PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us – we will take care of them.
GENERAL PATTERN WORKS
2233 Buck Street Cincinnati, Ohio

SUB-CONTRACT FACILITIES FOR
Hand screw machine products.
Engine and bench lathe, milling the drill press work.
Small sheet metal fabrications to closer than commercial tolerances.
Stampings.
We do our own tooling
RELIANCE MACHINE & MFG. CO.
Thirty Irving Place New York City
36 years experience in metal fabrication

METAL STAMPINGS
• TOOLS • DIES •
PERMANENT MAGNETS
HEAT TREATING
THOMAS & SKINNER STEEL PRODUCTS CO.
1103 E. 23rd St. INDIANAPOLIS, IND.

COMMERCIAL HEAT TREATING
Seasoning of Steel, Nitriding
Centerless, Broach, Thread Grinding
Magnaflux & Optical Testing
Metallurgical & Chemical Laboratories
Cadmium & Hard Chrome Plating
ENGINEERING DIVISION
AGERSTRAND CORPORATION
Muskegon, Michigan

DESIGN & BUILD JIGS, FIXTURES & GAGES
REED MACHINE & TOOL ENG.
BOX 662
PAWTUCKET, R. I.

Gray Iron and Semi Steel Castings, also alloyed with nickel, chrome, and molybdenum. Wood, Iron, Brass and Aluminum pattern work.
KING FOUNDRIES, INC.
Phone 823 North Wales, Montg. Co., Pa.
22 Miles from Philadelphia, Pennsylvania

WE HAVE GEAR CUTTING CAPACITY AVAILABLE

ON 16" GLEASON HYPOID GENERATOR
ON 26" GLEASON HYPOID GENERATOR
for cutting Spiral, Zerol, Hypoid Gears up to 29" diam. 1½ DP.

ON 2C SYKES GENERATOR
ON 3C SYKES GENERATOR
for cutting grooved or continuous tooth Herringbone Gears up to 36" 3DP.

We have turning capacity to handle all gear work accepted.

WESTERN GEAR WORKS
LYNWOOD, CALIF.

PRODUCTION SURFACE GRINDING
AUSTIN P. CULLON
TOOL & ENGINEERING
2926 Biddle Ave. Wyandotte, Mich.

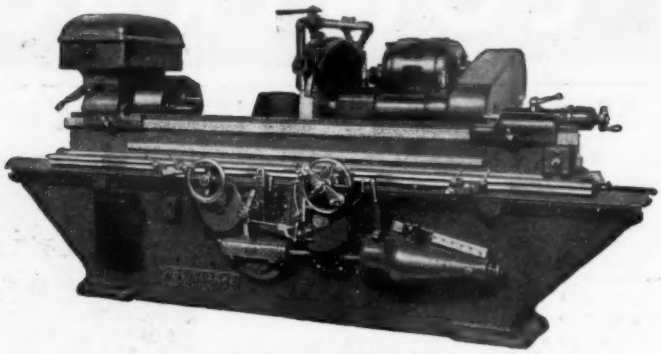
KIRK & BLUM
CONTRACT MANUFACTURING
ACCURATE SHEET STEEL
STAINLESS STEEL, MONEL OR
OTHER ALLOY FABRICATION
OUR SPECIALTY
CAPACITY 3/8" AND LIGHTER
THE KIRK & BLUM MFG. CO.
2823 SPRING GROVE AVE. CINCINNATI, OHIO

Complete Engineering Service
Consulting, Patent, Management, Plant Layout, Processing, Design & Build Automat'c Machinery, Jigs Fixtures, Tools, Dies. Patterns, Cast Iron Castings.
EMPIRE ENGINEERING
1700 Elmwood Ave. Buffalo, N. Y.

HILL-CLARKE

Modernized

CYLINDRICAL GRINDERS *for* SUPER-GRINDING *and* MICRO-FINISH



SIZES AVAILABLE

10x36	10x72	14x72	16x72
10x50	14x50	14x96	18x96

Hill-Clarke Modernized and Motorized Cylindrical Grinders offer refinements in design which minimize vibration and assure extreme accuracy on all grinding operations. One of these refinements, the Hill-Clarke Patented Multiple V-Belt Drive to work spindle, contributes to the smoothness in operation which makes possible a finish within a few micro-inches even when using standard grain free-cutting wheels.

Send for a copy of our catalog "Super Grinding."

Have you any NORTON grinders you wish modernized and motorized?

HILL-CLARKE MACHINERY CO. CHICAGO U.S.A.

HILL-CLARKE MACHINERY CO.

649 WASHINGTON BOULEVARD — CHICAGO, ILL.

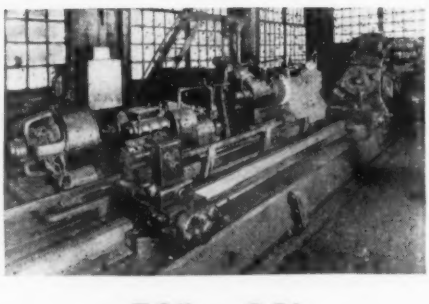
For Immediate Delivery at a Saving

GEAR MACHINES
36H G. & E. Universal, Hobber
36H G. & E. Cutter
B. & S. No. 3—26" cutter
G. & E. Production Bevel Cutter
Gleason 11" Bevel
Farwell No. 1 Hobber
Fellows No. 6, 61 Shaper

BORING MILLS
10' Niles Vert.
3½" Rochester, M.D.
4", 4½" Gisholt and Niles
54" Colburn M.D.
36" Bullard, Niles

AUTOMATICS
3—Potter & Johnston No. 6A Turret Lathes, M.D.

GRIDLEY AUTOMATICS
¾" to 4¼"



50" x 28'
NORTON
ROLL GRINDER, M. D.

A TYPICAL AARON ITEM

Write • Wire • Phone

GRINDERS
P. & W. 14", M.D.
Norton 12 x 18", M.D.
Landis 14" x 52"
Modern 12 x 48", M.D.
B. & S. No. 10, 11, 14
Blanchard 26" Surface

LARGE LATHES
48" x 26' Niles
48" x 12' Harrington Gap, sld. bed
26" x 13' Boye & Emmes
26" x 14' Rahn-Larmon rais. blks. to 34"
24" x 14' Rahn-Larmon
36" x 21" Wickes lathe, 3 step
30" x 20' LeBlond Std. Change
24" x 12' LeBlond, M.D.

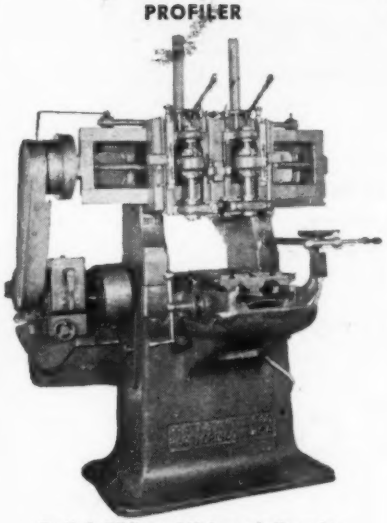
AARON MACHINERY CO.

45 CROSBY STREET
NEW YORK CITY, N. Y.
CAnal 6-0421-2

WAREHOUSE STOCK

"FALK" for DEPENDABILITY in Rebuilt Machinery

PROFILER



Pratt & Whitney #12 two spindle motorized profiler, Table 12"x15" equipped with 6" raising blocks, and 5 H. P. 3 ph. 60 cy. 220 V. motor—Turner drive mounted and wired to push bottom control—Rebuilt and guaranteed

MILLING MACHINES

P & W Duplex Miller #2
Becker #7 Lincoln Production Miller
Sanford #1½ Production Miller, Rotary Table
Cleveland Vertical Miller #1—(New)
Index Universal Vertical Miller (New)
No. 1 Brown & Sharpe Univ. Plain Milling Mach.
No. 1½ American Universal Milling Machine.
1—No. 2 Owens Plain Horizontal Milling Machine.
1—Gooley & Edlund Production Miller Type A.

GEAR CUTTERS

No. 1 ADAMS FARWELL Gear Hobber; complete.
No. 2 WHITON SPUR GEAR CUTTER, Auto.
1—No. 3 Barber Colman.

SHAPERS & SLOTTERS

24" Cincinnati Triple Geared Shaper, Fric. Dr.
20"x20"x24" N-B-P SHAPER-PLANER, arr. M.D.

24" Bullard Vertical Turret Lathe Rapid Production, motor drive.
30" Coburn Vertical Turret Mill, M.D.
3½" Rochester Floor Type Horiz. Boring Mill, M.D.

RADIAL DRILLS

2—Niles, Bement-Pond, flat column 5' arm.
Niles Bement-Pond, flat column 6' arm.

COILING MACHINES

No. 1 and No. 2 SLEEPER & HARTLEY BX CABLE COILING MACHINES ⅜ and ½" cap. Last used for Speedometer cable. Complete.

PUNCH, SHEARS & BRAKES

1¼" thru 1"—36" throat on punch end, 34" throat on shear end.
WICKES COMBINATION PUNCH AND SHEAR, MOTOR DRIVEN; 1¼" thru 1" Plate; Punching end 48" throat; Shearing end 36" throat; Continuous 6"x1" Plate.
Niagara No. 135 Deep Throat Punch Shear, Hydraulic Wheel Press 200-tons, 42" between strain bars. Self-contained, belt drive.
Niagara 36" foot Shear, 16 ga.
Kutscheid all steel 36"x16 ga. Foot Shear.
Pittsburgh 36"x3/16" Plate Shear, no holddown.
No. 236 PEXTO CIRCLE SHEAR, SPD; 16 ga.
No. 132 BLISS 14 ga., 12" throat, Slitter.
No. 232 BLISS 12 ga., 18" throat, Slitter.
No. 941½J Toledo Double Crank, Double Geared Twin Drive, Motor Driven Straight Side, Tie Rod Power Press, Bed Area 120"x50".
Toledo 93½J 125 Ton Power Press, Bed Area 95x34, Single Acting, 6" stroke, Double Geared Tie Rods.
Bliss No. 1 125 Ton Power Press, Bed Area 64"x37", Single Acting, 4" stroke.
No. 18, 18C, 19, 19C, Bliss, OBI.
No. 19 Truesdale OBI. Same as 19C.
No. 4 MICHIGAN OBI.
No. 6 Waterbury Backed Geared, Open Back.
No. 2 BLISS Back Flywheel Plain, (6).
No. 1—Bliss Back Flywheel Plain.
No. 15N BLISS, arr. Geared, Motor dr. (2).
No. 25N BLISS Geared, Motor dr.; (3).
No. 1 BLISS S.S. Toggle Press.
No. 103S BLISS GANG DIE PRESS; Roll Feed.
3-ton General Flexible Press.
36" NIAGARA 16-gauge Power Squaring Shear, Like New.
No. 30 BLISS ARCH PRESS, Plain.
No. 25 NIAGARA ARCH PRESS, Plain.
No. 71 Waterbury Coining Press, 25 Tons.
No. 93D TOLEDO DBLE. CRANK GEARED S.S. PRESS, Welded Frame.
No. 75 Toledo Open Back Plain Flywheel Press.
No. 2 Niagara OBI.
No. 3 American Can Co. OBI.
1—Niagara Combination Brake and Folder 6'x10 gauge, motor drive.

GRINDERS

14" Pratt & Whitney Vertical Surface Grinder.
No. 6 Besley Double Opposed Disc Grinder.
No. 2 & No. 3 Brown & Sharpe Cutter Grinder.
Taft-Pierce Automatic Pin Grinder.
Gardiner No. 4 Disc Grinder Double End, 20" disc, 16" ring wheel, ball bearing belt drive.
Badger No. 2 Double End Disc Grinder 16" disc, ball bearing spindle. Universal table.
1—Gisholt Drill Grinder.
Badger No. 2—16" Disc. Dbl. End. Univ. Tbls., Belt.
Gardner No. 1—double end Disc, 12", B.B. belt dr.
Gorton, double end disc grinder, 18" discs.
Sellers drill grinder.
#1 Le Blond tool and cutter grinder.

INTERNAL GRINDER

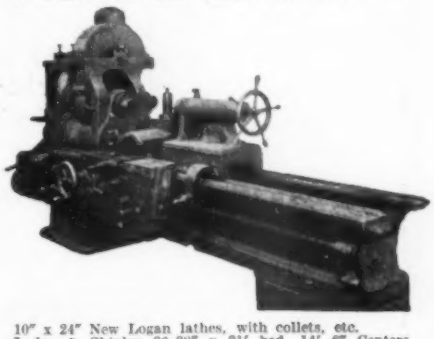
GREENFIELD No. 12. HYDRAULIC FEED, Motor Drive; Cap. swings 15"; Grinds automatically ¾" to 5" dia.; 4" Deep; New in 1928.

TURRET LATHES

1¼" Gridley "F" 4 spindle Automatic Screw Machine.
Millholland Geared Head Hand Screw Machine 1½" cap. Arranged motor drive, now equipped as Millholland Lassiter Staybolt Machine.
Jones & Lamson 3 x 36", Double Spindle, Motor Driven with Air Truck equipment.

LATHES

30"x12' Putnam Quick Change Gear Screw Cutting Engine Lathe, Arranged Motor Drive.
18x10' Reed Plain Change Lathe.
18"x12' Hamilton Plain Change Lathe.
18x6 South Bend Plain Change Lathe.
16x6 South Bend Plain Change Lathe.
1—13 x 6 Seneca Falls Quick Change Gear Lathe.
30" x 12' Putnam Quick Change Gear Lathe.



10" x 24" New Logan lathes, with collets, etc.
Lodge & Shipley 26-28" x 21' bed, 14' 6" Centers, Taper Attachment, Pan Bed with Oil Pump.

DRILLING MACHINES

MULTIPLE SPINDLE DRILLS

1—15 H Fox Hydraulic 35 spindles, #1 M.T., Motor Drive.
1—D-31 Fox, drilled for 32 spindles, fitted with 16, #2 M.T., rectangular head 17 x 34, power feed, elevating tapie motor drive.
1—No. 217 Baker, #5 M.T.
1—No. 3 Leland-Gifford 24", 2-spindle with power feed, #3 M.T.
3—Cannedy Otto Upright Drills.

TRIMMERS

2—Waterbury-Farrell Automatic Trimmers ⅝ cap.

THREAD MILLERS

Hall Planetary No. 2—24" Swing.
Lees-Bradner No. 8—12"x54.
Pratt & Whitney 6x14.

THREADING MACHINES

1⅛" Acme Single Head Bolt Threader, like new.
Acme ⅝" Double Head.
Acme 3" Single Head.
Landis 1½" Single Head Bolt Threading Machine.
National 2" Double Head, Geared M. Dr.
Williams 6" Pipe Threading Machine.
Merrill 10" Pipe, Motor Drive with motor.
Curtis Portable 4" Pipe Threading Machine.
Williams 2" Pipe Threading Machine.
Jarecki 2" Pipe Threading Machine.

AUTOMATIC CHUCKING MACHINES

1—No. 24 New Britain type 4 spindle, 5 chucking stations.
1—No. 23 New Britain type 4 spindle, 5 chucking stations.
1—Jones & Lamson Hartness Automatic Chucking Lathe Motor Driven 12" diam., 6" face, 6" width cap.
1—Brown & Sharpe #0 Cutoff, Serial 5563.

Buy From Stock

MACHINERY

FALK

MACHINERY CO.,

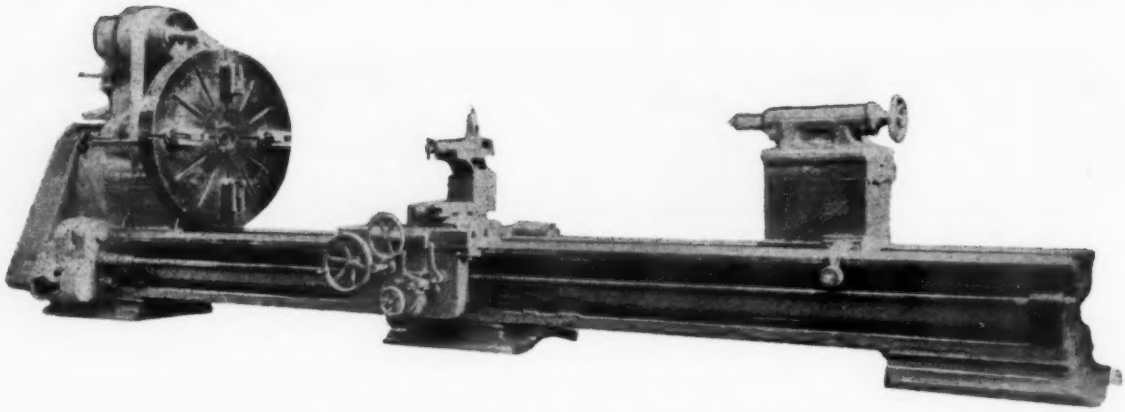
MERCHANTS

18 WARD ST.

ROCHESTER, N. Y.

Tel. Main 6347

EMERMAN offers for Immediate Disposal



60" x 26' Houston Stanwood Gamble Engine Lathe
Distance between centers 224", Quick change gears.
Equipped with 58" diameter faceplate, Arranged for motor drive.

WE INVITE YOUR INSPECTION OF THIS MACHINE ANY TIME AT YOUR CONVENIENCE

Louis E. EMERMAN & CO.

875 W. 120th St. **Chicago, Ill.**

LATHES

16" x 6' Lodge & Shipley Pat. Hd.
16" x 6' Lodge & Shipley Cone, Q.C.
26" x 10' Niles, Cone, Q.C.
36" x 22' McCabe H.D. Trip. Grd.

GRINDERS

Fitchburg Spline Shaft Grinder.
#55 Heald Cylinder.
Lees Bradner Gear Grinder.

MILLERS

#1 P & W Hand Miller.

GEAR MACHINERY

18" Gleason Bevel Gear Generators.
6" Bilgram Bevel Gear Generator.
18H Gould & Eberhardt Gear Hobber.
#1 Adams Gear Hobber.
#4—36" B & S Automatic Gear Cutter.
Lees Bradner Gear Grinder.
#3—26" B & S Gear Cutter.

PLANERS

24" x 6' Cincinnati Planer.
24" x 24" x 6' Cincinnati Planer.
24" x 24" x 6' Cincinnati Planer, Box bed M.D.

MISCELLANEOUS

18" Niles Bement Pond Slotter, Motor driven thru gear box.
12 Ga. 30" Throat Quickwork Shear, M.D.
14" Niles Slotter.
1500# Bell Steam Hammer.

CINCINNATI MACHINERY & SUPPLY CO.
217 East Second Street **Cincinnati, Ohio**

PROMPT DELIVERY

AUTOMATICS

7" Baird 6 spindle
6"x6¾" Goss & DeLeeuw
4½" Gridley model H
1⅝" National Acme No. 55
14" Fay
No. 6A Potter & Johnston
1" Cleveland Model J
No. 16 Gisholt Simplimatic

GEAR MACHINERY

No. 16 HS Gould & Eberhardt hobber
No. 12 Barber Colman hobber
No. 1 Lees Bradner hobber
26"x8" Brown & Sharpe automatic
24"x12" Flather automatic
36"x6" Gould & Eberhardt automatic
48" Brown & Sharpe automatic
60" No. 5A Cincinnati automatic
18" Gleason testers & lappers
15" Gleason spiral gear roughers
15" Gleason spiral pinion roughers
18" Gleason bevel gear generator
2 spindle Lipe chamferer
Pratt & Whitney worm grinder
National gear checker

LATHES

28" Steinle, 8" hole
24" Gisholt, 6½" hole
24" Steinle, 6¼" hole
22" Libby, 4½" hole
2¼x24 & 3"x36" Jones and Lamson
No. 1 ⅝" capacity hand screw
Nos. 4 & 5 Foster
13"x6' Automatic threading
Melling crankshaft 6 cylinder
3⅛"x36" & 4"x36" Lo Swing lathes
27"x14' Bridgeford heavy turning or axle 2 carriage
8" Sundstrand stub
9" Sundstrand Mfg.
1"x18" Pratt & Whitney automatic
14"x6' Lodge & Shipley with turret on carriage
22"x24" American with turret slide

GRINDERS

10x36 10x50 and 14x50 Norton
12x36 12x52 16x48 and 16x60 Landis
Capitol internal
Nos. 6 & 15A Bryant internal
20"x50" Safety surface
Nos. 50 & 60 Heald cylinder
18" 24" & 30" Gardner disc
24" No. 84 Gardner opposed disc
24" No. 221 Hanchett opposed disc
20" No. 120A Gardner opposed disc
17"x36"-48" Norton hydraulic crankshaft
Gisholt tool grinder
24" Ingersoll face milling cutter grdr.
30" Ransom elec. snagging
16" Norton snagging
No 575 Hawes tube polisher
18" Whitney wet tool
36" No. 5TGM Bridgeport wet
Cincinnati face milling cutter grinder
Pratt & Whitney grinder for worms

MILLING MACHINES

No. 3 Turnmilling for round work
Nos. 1 & 1A Davis & Thompson drum type duplex
48" Oesterlein tilted offset
Nos. 10 & 45 Productomatics
5" and 12" Pratt & Whitney automatics
Model AB Becker vertical
Type C Hall planetary thread miller
Taft Pierce thread miller
28" Cincinnati Duplex
3⅞" Beaman & Smith horizontal boring mill
36" Garvin cam & form miller

PLANERS

24"x24"x5' Gray
24"x24"x6' Woodward & Powell
29"x29"x6'3" New Haven
36"x36"x10' Betts 2 heads
36" Morton draw cut shaper

SEND FOR STOCK LIST.

MILES MACHINERY CO.
SAGINAW, MICH.

1—72"x36"x10' table Ingersoll Mill
1—No. 1 Lumsden Oscillating Tool Grinder, M.D.
2—Gridley four-spindle Model H Chucking Machines, M.D.

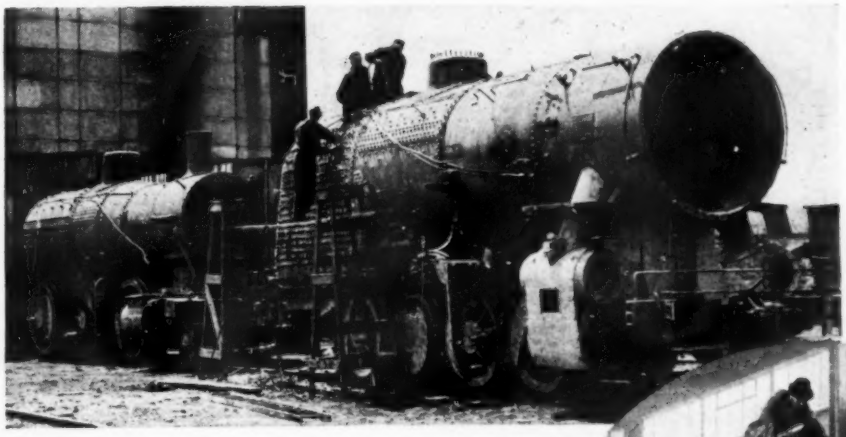
D. E. DONY MACHINERY CO.
47 Laurelton Road **Rochester, N. Y.**

BORING MILL 60" N.-B.-T., R.P.T., M.D.
BORING MILL 84" N.-B.-T., R.P.T., M.D.
GEAR PLANERS, Bevel, 36" & 54" Gleson, M.D.
GRINDER, Surface, UK-500 Hanchett 24"x10" M.D.
LATHE, Turret 34" Gisholt, 4¼" H.S., M.D.
MILLER, Plain No. 1 Cincinnati, M.D.
PRESS, Dbl. Crk. 95-B Toledo, bed 55" x 54".
PRESS, Toggle No. 14 Bliss, stoke 18.
PRESS, Hydr., 1000 ton Wood, platen 42" x 9'.

Lang Machinery Company
28th St. & A. V. R. R. **Pittsburgh, Pa.**

POWER PRESSES
BLISS, TOLEDO, V & O, ETC.
REBUILT — GUARANTEED

JOSEPH HYMAN & SONS
Tioga, Livingston and Almond Streets
Philadelphia Pa.



CAN IT RUN? then get it running!

Fifty-eight discarded engines that could! The New Haven Railroad has rebuilt and restored to service that many graveyard-bound locomotives. To meet the staggering demands of wartime transportation, the railroads are determined that "if it's got wheels, get it rolling!" As you can see, the New Haven is doing just that, reconditioning them from the wheels up. ★ Of vital machine tools, the Simmons slogan is, "If it can run, get it running—and keep it running!" Here at the country's largest rebuilding plant machine tools of all categories and sizes are restored to active service—from large open-side planers (see photograph) and 110″ gun lathes to toolroom millers and screw machines. Railroad shops, shipyards and automotive plants, among others, are using machine tools rebuilt and modernized by Simmons engineers. If you have a metal-working problem, let Simmons take it over. Simmons Machine Tool Corporation, 1759 North Broadway, Albany, N.Y.

SIMMONS ENGINEERED *Machine Tool* REBUILDING

USED AND REBUILT MACHINERY

AUTOMATICS

New Britain, 6 spindle, 1⅝" Cap. M.D.
Gridley, Single spindle, 2¼" Cap.
#55 National Acme, 1⅜" Cap. M.D.

BORING MILLS

42" Bullard Vertical, 2 Heads on rail
4" Bickford Horizontal, Single Pulley

GRINDERS

Modern, Cylindrical, 16x60" M.D.
Diamond Surface, 12x14x54" M.D.
Storm 8x10" M.D.

LATHES

Monarch 18"x16'. G.H. Motor in base, taper, Rapid Traverse.
Lathe & Morse 26"x12'
Rahn & Larmon 18"x36"x8'. Q.C. Taper
Lodge & Shipley 16"x10'. Q.C.

MILLERS

#3 Hendey, M.D.
#2 Cincinnati Universal
#3 Garvin-Duplex 12x64"
#7 Becker Production

PLANERS

Bicket (Cincinnati, Ohio) 42 x 42 x 12'. Heavy M.D.

RADIAL DRILLS & DRILL PRESSES

6' Niles Universal Radial Drill, 13" round column.
Foote Burt Drill Press, heavy duty.
Gould & Eberhardt Drill Press, 24" Sliding Head, Compound Table.

SHAPERS

From 10" to 24".

TURRET LATHES

#6 Warner & Swasey
Garvin S.P. 12½"
Jones & Lamson, 3 x 36" 2 Sp.

ALSO

Form Rolling Machines (3 Sets Form Rollers)
Geo. A. Ohl Power Shear, 10', 14 Guage.
Niagara Power Press, #66-E
12" Newton Slotters.

THIS IS A PARTIAL LIST
SEND US YOUR INQUIRIES

What do you have to offer in single tools or entire plants?

Our Specialty

Installing Complete Plants

S. & S. MACHINERY CO.
207 Centre St. New York, N. Y.
Phone: WOrth 4-5710

"Ok'd by Botwinik"

LATHES

New Lyon-Robbins 14" x 8' Motor in Base Timken Bearing Engine Lathes.
1—Libby 18" Type "A" Turret Lathe.
1—Fitchburg 8"x108" Lo-Swing Lathe—2 carriages.
1—Lodge & Shipley 16" x 8' QCG Engine Lathe—M.D. Pan bed.
1—Sellers #709 Engine Lathe. Swing 36" x 10'.
1—New Haven 24-36" x 15 LVH Lathe, on risers. Hollow spindle.
1—Johnson 30 x 24 Triple Geared Lathe.
1—LeBlond 14" x 8' QCG Engine Lathe—M.D.
1—Bullard 18" x 12' LCG Engine Lathe—M.D.
1—Wickes 31" x 11' Semi-Automatic Crankshaft Lathe.
1—Pratt & Whitney 1 x 10 Automatic Turning Lathe.

PLANERS

1—Whitcomb-Blaisdell Second Belt Drive 30" x 30" x 12' Single Head Planer.
1—Wheeler 30" x 30" x 12' Single Head Planer.

SHAPERS

1—Bement Niles 17" Single Traveling Head Shaper. Length of bed 6'5".
1—Fellows 36" Gear Shaper.

PRESSES

1—Waterbury-Farrel #6½ Double Crank Press—Diam. of crankshaft 5". Stroke 1¾". Between uprights 29½"
1—V & O #4 Inclinable Press—Open Back.
1—Adriance #5 Inclinable Open Back Press.
1—V & O #61 Straight Sided Press.

GRINDERS

1—Norton 15" x 15" x 96" Open Side Surface Grinder with magentic chucks, motorized.
2—Norton 14" x 15" x 72" Open Side Surface Grinders—M.D. with magnetic chucks.
1—Norton 10" x 50" Cylindrical Grinder—M.D.
1—Bryant #12 Internal Hole Grinder—Factory M.D. 15½" swing. Wheel slide traverse 10½". Max. grinding length 8".
1—Cincinnati #1½ Universal Tool & Cutter Grinder.
1—Gardner #24—53" Disc Horizontal Grinder.

MILLERS

3—New Briggs Type A Improved Production Milling Machines with Hydraulic Feed.
1—Becker Model C Vertical Miller, M.D. Table 55 x 14".
1—Becker #7-H Lincoln Type Miller.
1—Cincinnati 28" Plain Miller, Semi-Auto. With intermittent feed and power quick return.
1—Becker #1 Vertical Miller with foot treadle and 13" rotary table.
1—Pratt & Whitney #2 Lincoln Type Miller. Table 32" x 6".
7—Pratt & Whitney 12" Automatic Millers with receding tables.

DRILLS

1—Fosdick Machine Tool Co., 5' M.D. Full Univ. Radial Drill.
1—Aurora 35" Sliding Head Upright Drill with #4 Morse taper.
1—Hammond 4' Sensitive Radial Drill.
1—Baush #1 24-Spdle. Multiple Drill, M.D.

HAMMERS

1—Bradley 80-lb. Rubber Cushioned Helve Hammer.
1—E. W. Bliss 600-lb. Board Drop Hammer.
1—Bell 600-lb. Steam Hammer and base.
1—Chambersburg 1200-lb. Hammer and base. Board Drop.
1—Bell 850-lb. Steam Hammer—Guide Ram type.

UPSETTERS

1—Ajax Upsetting Forging Machine, 4" capacity.
1—National Upsetting Machine, 4" capacity.

MISCELLANEOUS

2—Bullard 24" Vertical Rapid Production Boring Mills.
1—Nilson #4 Four Slide Wire Forming Machine.
1—Goss & DeLeeuw 6" 5-Spdle. Chucking Machine, arr. for M.D.
1—Niles 12" Vertical Slotter.
1—Pratt & Whitney 4" 2-Spdle. Centering Machine.
1—W. W. Sly No. 00 Sand Blast Outfit, 32" diam. x 48" sand tank.
1—Niles 12" Vertical Slotter.

WIRE US your requirements

Botwinik Brothers of Mass. Inc.
94 GOLD STREET WORCESTER, MASS.

500# B&S Board Drop Hammer.
1000# & 2000# Steam Forging Hammers.
#14 Cochrane-Bly Vert. Miller & Shaper, M.D.
50" G & E Gear Cutter.
#55 Heald Internal Grinder.
10' Bridgeport Knife Grinder.
20"-24" G & E Shapers.
36" Morton Draw Cut Shaper.
No. 2 Baker Keyseater, 2"x20".

WEST PENN MACHINERY COMPANY
1210 House Bldg. Pittsburgh, Pa.

36" x 24" **PUTNAM** Heavy Duty Triple Geared, Internal Geared Faceplate Drive Engine Lathe. Arranged for motor drive. Swings over ways—38".

LANDIS 8" to 18" inclusive Pipe Threading Machine. Gear box, single pulley drive.

ALSO MANY OTHER TOOLS

ALEX ZEEVE & COMPANY
2269 Woolworth Bldg. New York, N. Y.

MISCELLANEOUS MACHINES

30x30x12' Gray Spur Grd. Planer, m.d.
12x18" Cinci. Plunge Cut Grinder, m.d. with 9" face wheel, and oscil. att.
3' Carlton Sensi. Radial, with tapping att.
6' Niles Plain Radial Drill
5', 13" col. Cinci-Bick. Plain Radial
#5A P.&J. Chucking Machine, with hardened ways
#45 G.&L. Hydraulic Surface Grinder with mag. chuck
#4 G.&L. Hydraulic Surface Grinder with mag. chuck

STRONG, CARLISLE & HAMMOND COMPANY
1392 West 3d St. Cleveland, Ohio
2832 E. Grand Blvd. Detroit, Mich.

IF YOU ARE DOING DEFENSE WORK

Send for Our Latest Circular Covering Bargains in Small Tools Such as Drills, Reamers, Turret Attachments, etc.

DeWITT TOOL COMPANY
173 Grand St. New York City

10' Niles Vertical Boring Mill
1-⅜", 1-¾", 2-¼" Gridley 4 spindle M.D.
1" 2¼" Nat. Acme, 4 spindle
2¼", 4¼" Gridley sgl. spindle

PLANERS

24"x24"x6' Flather, 1 head
24"x24"x6' Whitcomb, 2 heads
32"x32"x10' Pond, 1 head
35"x42"x10' Davis, 2 heads
30"x30"x8' Gray, 1 head
36"x36"x12' Niles, 1 head

CANAL MACHINERY COMPANY
176 LAFAYETTE STREET, NEW YORK, N.Y.

12—Garvin #1 Profilers with 1 and 2 spindles, only 1 spindle motorized with 3 phase, 60 cycle, 550 volt, 3600 RPM A.C. Motor. Motors can be easily changed to 220 volt at slight cost. Suitable for irregular milling on either wood or metal. All guaranteed in good working order. Price for quick sale $500.00 each.

6—Bradley 40# Helve Type Forging Hammers, Price $250.00 each

For further particulars write, wire or phone

MDNA

JOSEPH BEAL & CO.
465 Atlantic Ave. Boston, Mass.
Hancock 6460

FOR SALE—WELDER

One Federal P-3, 200 KVA, 60 Cycle, press type welder, Serial 9015, complete with spiral fixtures, one set of dies, and current control, (price—$4913.85). We use in connection with this welder a special vacuum pump unit with tank, (price—$106.25). This makes our total selling price $5020.10, F. O. B. our plant, packed for shipment.

BALCRANK, Inc.
Disney nr. Marburg, Cincinnati, O.

MOREY DEPENDABLE USED MACHINES

1 BULLARD 24" R.P. Vertical Turret Lathe without Side Head
G & E 48" Gear Cutter
GLEASON 10" Spiral Bevel Gear Gen.
GLEASON 6"-18" Bevel Gear Gen.
HEALD No. 70A Duplex Internal Grinder
HEALD No. 60 Internal Grinder
INGERSOLL 24" Cutter Grinder
LANDIS No. 3½ Int. Hyd. Race Grinder
AUTOMATIC MACHINE CO. 12"x4' Quick Return, Taper and Relieving Type Lathe for manufacturing taps
BECKER No. 3 Vertical Miller (Mfgr. Reed Prentice) M.D.

100 Assorted Milling Machine Attachments
DIVIDING HEADS
Vertical-Slotting—Rack Cutting
For BROWN & SHARPE—CINCINNATI — KEARNEY & TRECKER — Le BLOND — HENDY — OHIO — ROCKFORD — KEMPSMITH

For Immediate Delivery:
3—*New FRAY*
ALL ANGLE MILLING ATTACHMENTS
Style "C"—Back Geared, Motor Drive, 3 phase, 60 cycle, 220 Volt

P. & W. No. 12 Multi-Spindle Drill
NATCO C-13 Hyd. Multiple Spindle Drill
ESPEN LUCAS No. 138 Cold Saw —Cap. 12"
FELLOWS #712 Gear Shaper
LANDIS 4" Single Head Bolt Threader
ACME 1" All Steel Upsetter
SAUNDERS 8"-18" Pipe Threader
THREADWELL 12" Pipe Machine
GISHOLT Precision Balancing Machine
LONG & ALSTATTER Angle Shears
GRAY 26"x26"x6' Planer—M.D.
AMERICAN 30"x30"x14' Planer 2 heads, M.D.

THIS IS A PARTIAL LIST

• *Write us* •
your Specific Inquiries

MOREY MACHINERY CO., Inc.
419 BROOME ST NEW YORK

. . IN STOCK

AUTOMATICS
⅞" Gridley Model G, four spindle
¾" Gridley Model F, four spindle
1¼" Gridley Model F, four spindle
No. 515 National Acme, four spindle
2½" Cleveland Model A, single spindle
⅝–⅞ Cleveland Model B, single spindle

BROACHES
American Hydraulic
Oilgear Hydraulic

DRILLS
20" Barnes Camelback Drill & Tapper
30" Superior Upright
36" New Haven Upright
No. 25 Foote-Burt
No. 15½ Foote-Burt Fixed Center
No. 12 Natco Multiple Spindle

GEAR CUTTERS
No. 3 Brown & Sharpe Automatic
96" Gleason Gear Planer
15" Gleason Spiral Bevel Generator
No. 10 Lees-Bradner Gear Grinder
30" Rochester Gear Tooth Rounder

GRINDERS
22" x 48" Pratt & Whitney Vertical Spindle Surface, Timken Bearing
30" Diamond Face, 84" Table Travel
10" x 20" Landis Cylindrical hydraulic
14" x 50" Norton Cylindrical
No. 60 Heald Cylinder

LATHES
No. 4 Elgin Precision Bench, c.d.
9" Sundstrand Manufacturing, q.h.
18" x 8' Lodge & Shipley, c.d.
32" x 12' Pittsburgh, c.d.

TURRET LATHES
No. 1 Warner & Swasey, c.d.
2" Warner & Swasey, q.h.
18" Libby, q.h.
24" Steinle, q.h.
No. 6A Potter & Johnson, q.h.

MILLS
No. 3 Brown Sharpe Vertical, s.p.d.
No. 4 Cincinnati, c.d.
No. 2 Cincinnati, s.p.d.
No. 21 Brown & Sharpe, motor in base
4" Pratt & Whitney Spline
4½" x 12" Pratt & Whitney Thread Mill

MISCELLANEOUS
10' x 3/16" Stamco Gap Shear
10' x 14 Ga. Stamco Squaring Shear
No. 8 Whiting Comb. Punch & Shear
No. 2 V & O Press, O.B.I.

SAWS
6" x 6" Peerless Universal Shaping, m.d.
No. 12 Higley Cold Cut, 16" blade

RESTORE YOUR WORN MACHINES

by having us rebuild them. We have a complete rebuilding department operated by men thoroughly trained in rebuilding. Your machines are taken down, carefully checked for wear, and worn parts are replaced, bearings and ways scraped and refitted. You'll find when rebuilt by us they'll perform like they did when they were new.

Write, wire or phone us.

INDIANAPOLIS MACHINERY & SUPPLY CO., INC.
1959-69 South Meridian Street
INDIANAPOLIS, INDIANA
Eastern Branch:
44 WHITEHALL STREET, NEW YORK, N. Y.

EASTERN OFFERS FROM STOCK

HORIZONTAL DRILLS
6 spindle National Acme Horizontal
No. 008 Garvin Horizontal Duplex
Love Bros. Horizontal, No. 4 Taper
No. 1 Pratt & Whitney 2 spindle Gun Barrel
Pratt & Whitney Rifling Machine
Baush Rifling Machine
5 spindle Detroit Horizontal

MULTIPLE SPINDLE DRILLS
3 spindle Rockford 12" Gang
4 spindle Harrington H.D. Rail
No. 1 Baush, m.d., 16x20" head (5 in stock)
No. 2 Baush, m.d., 16x30" head
No. 2 Baush Hydraulic, m.d., 16x30" head
No. 2 Baush Hydraulic, m.d., 38x21" head
D2 Fox Straight Line, 7 spindles
No. 3 Baush, m.d., 20x40" head
No. 3 Baush, m.d., 16x30" head
D11 Fox, m.d., 30x14" head
No. 11 Pratt & Whitney, 14x9" head
No. 22AC Fox, m.d., 16" round head
No. 26C Fox Tapper, 17x35" head
No. 30 Natco, m.d., tapping attach. 38x22" head, No. 3 spindles
No. 51C Harrington, 22" sq. head

RADIAL DRILLS
2½' Avey Sensitive
3' American Maxi-Speed Sens., m.d. on arm
3' Carlton Sens.
3' Cincinnati Bickford Plain, m.d. thru gear box
4' American Triple Purpose Plain, m.d.
4' Hammond Jack-Knife
4' Hammond Jack-Knife, wall type
4' Niles-Bement-Pond Semi-Universal, m.d.
5' Niles-Bement-Pond Full Universal, m.d.
5' Prentice Plain, m.d.
6' Niles-Bement-Pond Semi-Universal, m.d.

UPRIGHT DRILLS
10, 12" Barr
12" Myers
12", 14" Mechanics
20" Barnes Camel Back
21" Champion
22" Barnes All Geared Self-Oiling
24" Aurora
24" Cincinnati Bickford Super-Service with mult. head
24" Cincinnati
24" Hoefer
24" Milwaukee
30" Rich Heavy Duty, No. 5 Taper

AUTOMATICS
4 spindle ⅞" Cleveland Model M, m.d.
2¼" Gridley Single Spindle, m.d.
3¼" Gridley Single Spindle, m.d.
No. 6D Potter & Johnston, m.d. arr. for brake drum work
No. 22, 23, 33 New Britain Automatics

ARBOR PRESSES
No. 5 Greenerd
King Screw Press, 36" between uprights
Barnes Screw Press
15 ton Lucas Forcing

BOLT THREADING MACHINES
¾" Economy Style R
1"—2 spindle Acme
1"—3 spindle Acme
1½" Acme
No. 11-S Rickert-Shafer Auto. 1"
American Bolt Header, 1¼" cap.

BORING MILLS
4" Lucas Horizontal, m.d.
4" double Spindle Barrett Horizontal, m.d.
2—¾" Sargent Floor Type Horizontal
30" Colburn Vertical, 1 head
42" Colburn Vertical, m.d., 2 heads
42" Niles Car Wheel Borer
48" Niles Car Wheel Borer

BROACHING MACHINES
Cincinnati Mill Broach, new
No. 2 LaPointe
No. 2 LaPointe of Hudson
No. 3 J. N. LaPointe Double

BALL BEARING DRILLS
1 spindle Allen
Automatic Sensitive, m.d.
No. 2 Avey 1 spindle
2 spindle Sigourney
1 spindle No. 3 Avey
1 spindle Henry & Wright
3 spindle Barr
4 spindle 13" Fosdick Super-Speed
4 spindle Gardam
4 spindle Henry & Wright
4 spindle No. 2 Fosdick, power feed
4 spindle Kokomo
6 spindle Henry & Wright

Many other machines in stock. Let us quote.

The EASTERN MACHINERY CO.
1004 TENNESSEE AVE.
CINCINNATI, OHIO

SEARCHLIGHT SECTION

GUARANTEED USED MACHINE TOOLS

DRILLS

4 spdl. Sigourney (4)

4 spdl. Henry & Wright (19)

MILLERS

26" x 36" x 10' Ingersoll

26" x 25" x 12' Ingersoll

GEARS CUTTERS

No. 60BM Gould & Eberhardt Bevel Gear Rougher (2)

GRINDERS

(See page 238, Hill-Clarke Cylindrical grinders)

No. 40 Bryant Plunge Cut, Wide Wheel, Oscillating

No. 10 Lees-Bradner Spur Gear Grinder 1½" dia. New Yankee Drill Grinder

TURRET LATHES

18" Libby

HILL-CLARKE MACHINERY CO.
649 Washington Boulevard
Chicago, Illinois

BOLT AND PIPE THREADERS—1½" & 3" National; 10" Saunders Pipe; 2½" Landis Bolt, M.D.

BORING MILLS—10' Betts Heavy Duty, 108" table, M.D.; 72" Betts, M.D.

RADIAL DRILLS—6' Cinci. Bickford Pl. Gear box; 5' N.B.P. Univ. Gear Box; 4½ Morris Pl. Gear Box.

CHUCKER—#34 New Britain.

GRINDERS—30" x 240" Landis Cyl. 24" Bridgeport Disc D.C., M.D. 24" x 96" Landis Cyl. 20" x 96" Landis Cyl.; 14" x 96" Cinci. M.D.; 12" x 96" Landis; 12" x 120" Landis; #6 Landis Internal.

GEAR CUTTERS—11" & 6" Gleason Bevel Gear Generators; 36" G & E Spur and Bevel; 30" Newark Spur, new 1928; 36" x 10" Cinci. Spur.

KEYSEATERS—#6 Catlin 40" stroke x 5" wide; #6 M. & M. 31" stroke x 3½" wide.

PLANERS—48" x 48" x 16' Cinci., 4 hds., M.D.; 36" x 36" x 12' Putnam, 3 hds., M.D.; 27" x 6' Woodward Powell, M.D.

LATHES—18" x 6' Greaves Klusman Grd. Hd.; 32" x 12' Pittsburgh, Q.C.G. blocks to 44"; 36" x 16' Bridgeford Grd. Hd., T.A. 36"/60" x 15' Harrington Gap; 64" x 28' New Haven.

ROSENKRANZ MACHINERY CO.
30 Church Street — New York, N. Y.

LATHES

14"x6' Mulliner—cone

GEAR MACHINERY

Type A Barber Colman Gear Hobber
No. 12 Barber Colman Gear Hobber, M.D.
24HS Gould & Eberhard Gear Hobber, M.D.
9" Pratt & Whitney Gear Grinder, M.D.
11" Gleason Bevel gear generator
Cimatool gear chamfering M.D.
Lees-Bradner Gear Grinder

TURRET LATHES

6x6½" Goss & DeLeeuw

MISCELLANEOUS

8" Bullard Multimatic M.D.
36'x36"x8' Woodward & Powell Planer Rev. M.D.
No. 303 Bliss St. side. Gd. Press M. D.
Lees-Bradner Spline Hobber 6"x54"

DRILLS

New Delta Drilling Equip.
4 Spindle Taylor & Finn, M.D.

WIGGLESWORTH MACHINERY CO.
203 Beat St., Cambridge, Mass.

FOR SALE

LATHE

Lodge & Shipley 36" x 12' Selective 12-Speed Geared Head Lathe with 36" chuck, taper attachment, 15 H.P., 220-volt, 60-cycle, 3-phase motor—excellent condition.

OGDEN R. ADAMS
264-266 State St. — Main 6374-5
Rochester, New York

CRANE FOR SALE

5-ton overhead traveling

Cab control 48'8" Span 3 motors, 220-3-60AC
Mfg. by V. R. Browning—Complete
IMMEDIATE DELIVERY
THE AMERICAN WELDING & MFG. COMPANY
Warren, Ohio

FOR SALE

GRINDER

Blanchard 16A, Automatic Grinder, Serial 1973, 30" dia. chuck, 30 H.P., 3 phase, 60 cycle, 3 phase, 220 or 440 motor in spindle. Purchased in 1929.

Standard Machinery & Supply Co.
218 High Street — Boston, Mass.

LARGE SURFACE GRINDER

Magnetic chuck 16x40" wet or dry—Diamond #3. Overhauled—motorized $2100.00. Photograph available.

EVEREADY ELECTRIC & SUPPLY COMPANY
805 Housatonic Avenue — Tel. 4-1762
Bridgeport, Conn.

OTT MACHINERY SPECIALS

AUTOMATICS, Acme, #55 & 2"
AUTOMATICS, Gridley, 2¼, 3¼ & 4¼" S.S.
AUTOMATICS, Cleveland, 2" 18" feed Model B
AUTOMATICS, Cleveland, ⅞" 4 spdle. cut-off, M.D.
AUTOMATICS, Cone, 2½" 4 spdle., M.D.
AUTOMATICS, #22, 23 & 24 New Britain
AUTOMATICS, Potter & Johnston #5A & 6A
GEAR HOBBERS, #3 & 12 Barber-Colman
GRINDERS, Norton, 14x36" Plain, M.D.
LATHE, Putnam, 60"x17' with 12" Riser Blocks, total swing 85" M.D.
LATHE, 3x36" J.&L. Dble. Spdle.
LATHE, Sundstrand, 8" Stub, M.D.
MILLING MACHINE #8 Becker Duplex, M.D.
MILLING MACHINES, Craftsman #1 & 2
MILLER & DRILLER, Knight #2
PLANERS, 36x36"x10' Hamilton 2 Heads M.D.
PLANERS, 42x42"x12' Ohio, 1 Head, M.D.
PRESSES, Toledo, #34 Solid Back, S.G.
PRESSES, Toledo, #2 to 5 Open Back Inclinable
PRESSES, Ferracute, P2, 3 & 4, Solid Back
PROFILERS, 2 spdle. Garvin & #2 Pratt & Whitney

OTT MACHINERY SALES, INC.
542 Second Ave. — Detroit, Mich.

IMMEDIATE DELIVERY

Single Frame Steam Forging Hammers

3—800#, one 1100#, one 1500#

Saunders Machinery Exchange
P.O. Box 1944 — Cleveland, O.
Phone CE 6132

FOR SALE

One New Sandford Precision

SURFACE GRINDER

Immediate delivery

JOHN A. CROWLEY CO.
120 Liberty St. — New York, N. Y.

UNUSUAL VALUES

Bolt Cutter 1" capacity 3 spindle
Brake Robinson 5' toggle
Compressor 6" x 5" Pennsylvania
Drill, new 10" Buffalo bench
Drill, ceiling suspended, unlimited drilling area
Drill Presses 20", 24" and 26"
Drill Press, 20" three spindle Barnes
Grinder #20 Bryant deep hole internal
Grinder 60" plate
Grinder #60 Heald, cylinder
Grinder, Sellers Tool
Lathe 14"x12' Lodge-Shipley grd. hd. s.c. mtr. dr.
Motors—new ⅓ to 30 HP 3 phase ball bearing. Also rebuilt motors.
Pipe Machine, 6" Oster (new)
Press #8-7 Zah-Habnemann straight side grd.
Punch & Shear ⅞" capacity Rock River
Punch & Shear, two ½" capacity
Threading Machine #0 Webster & Perks
Turret Lathe L & D brass, cross slide turret
Vacuum Cleaner, heavy duty for shop use

THE OSBORNE & SEXTON MACHINERY CO.
COLUMBUS, OHIO

NEW "SEARCHLIGHT" ADVERTISEMENTS

received by May 3rd, will appear in the May 13th issue, subject to limitations of space available.

Address copy to the Departmental Staff

AMERICAN MACHINIST
330 West 42d St., New York City

HAVE YOUR NORTON GRINDERS MODERNIZED AND MOTORIZED

WE ARE IN A POSITION TO TAKE ON A LIMITED NUMBER OF THESE AT THE PRESENT TIME

SEE GRINDER AD ON PAGE 238

HILL-CLARKE MACHINERY CO., CHICAGO, ILL.

Phone: Haymarket 7660 — **Cable Address: "Remand"** — **651 Washington Blvd.**

ADVERTISERS INDEX

	Page
Abbott Ball Co	192
Abrasive Machine Tool Co	202
Acme Machine Tool Co	34
Acromark Corp	158
Adams Company	174
Aladdin Rod & Flux Mfg. Co	158
Allegheny Ludlum Steel Corp	155
Allis-Chalmers Mfg. Co	69
American Brass Co.	140
American Chain & Cable Co., Inc	164, 228
American Magnesium Corp	29
American Optical Co	229
American Screw Co.	146
American Tool Works Co	16
Ampco Twist Drill Co	116
Armstrong-Blum Mfg. Co	66
Armstrong Bros. Tool Co	17
Atlantic Machinery Corp	200
Atometric Precision Gage Laboratories Inc.	228
Automotive Maintenance Machinery Co.	145
Auto-Ordnance Corp.	57
Avey Drilling Machine Co., Inc	233
Axelson Mfg. Co	184
Baldwin-Southwark Div. Baldwin Locomotive Works	129
Barber-Colman Co.	35
Barnes Drill Co.	204
Barrett Co., Leon J	150
Baumbach Mfg. Co., E. A	224
Bayard & Co., Inc., M. L	168
Behr-Manning Corp.	182
Bilgram Gear & Machine Works	175
Bissett Steel Co.	170
Blake Co., Edward	202
Blanchard Machine Co	67
Blank & Buxton Machinery Co	166
Blount Co., J. G.	190
Bodine Corp.	211
Braun Gear Co.	175
Brewster-Squires & Co	234
Bridgeport Safety Emery Wheel Co	228
Bristol Co.	146
Brown & Sharpe Mfg. Co	177
Bryant Chucking Grinder Co	65
Buhr Machine Tool Co	206
Bullard Company	41
Burke Machine Tool Co	212
Cadillac Gage Co	32
Campbell, Andrew C., Div. American Chain & Cable Co., Inc	228
Carboloy Co., Inc.	119
Carborundum Co.	199
Carlton Machine Tool Co.	158
Central Screw Co.	146
Century Electric Co.	167
Chandler Products Corp.	146
Chicago Wheel & Mfg. Co.	137
Chaso Tool Co	220
Cincinnati Bickford Tool Co.	71
Cincinnati Electrical Tool Co.	208
Cincinnati Gear Company	174
Cincinnati Grinders, Incorporated	10, 11
Cincinnati Lathe & Tool Co	194
Cincinnati Milling Machine Co	4, 5
Cincinnati Planer Co	206
Clayton Mfg. Co.	207
Clearing Machine Corp.	61
Cleveland Crane & Engineering Co.	221
Cleveland Hobbing Machine Co.	62
Cone Automatic Machine Co., Inc.	33
Continental Screw Co.	146
Corbin Screw Corp.	146
Coulter Machine Co., James	212
Covel Mfg. Co.	58
Crafts Co., Inc., Arthur A	222
Cushman Chuck Co	188
Danly Machine Specialties Inc.	194
Davis Keyseater Co	226
Dearborn Gage Co.	134
Desmond-Stephan Mfg. Co.	198
Detroit Die Set Corp	226
DeVlieg Machine Co.	38
Dixon Crucible Co., Jos.	170
Douglas Machinery Co., Inc.	198
Eastern Machine Screw Corp.	222
Errington Mechanical Laboratory	210
Etna Machine Co	226
Ex-Cell-O Corp.	52, 53
Farrel-Birmingham Co., Inc.	173
Federal Bearings Co., Inc.	156
Federal Products Corp.	227
Fellows Gear Shaper Co.	8, 9
Fitchburg Engineering Corp.	219
Fitchburg Grinding Machine Corp.	63
Fosdick Machine Tool Co.	40
Gallmeyer & Livingston Co.	204
Ganschow Gear Co.	175
Gear Specialties, Inc.	172
General Electric Co.	44
General Machinery Corp. (Mass.)	202
General Machinery Corp. (Ohio)	56
Genesee Tool Co.	133
Geometric Tool Co.	208
Gisholt Machine Co.	39
Gleason Works	3
Gorton Machine Co., George	225
Goss & deLeeuw Machine Co.	192
Grant Gear Works	175
Grant Mfg. & Machine Co	224
Gray Co., G. A.	217
Greenfield Tap & Die Corp.	151
Hall Planetary Co.	216
Hamilton Tool Co.	210
Hanna Engineering Works	208
Harper Co., H. M.	146
Hardinge Brothers, Inc.	51
Harnischfeger Corp.	193
Hartford Special Machinery Co.	174, 218
Haskins Co., R. G.	210
Haynes Stellite Co., Division Union Carbide & Carbon Corp	195
Heald Machine Co.	2nd Cover
Hecker, A. W.	189
Henry & Wright Mfg. Co	226
Hill-Acme Co.	197
Hobart Bros. Co.	158
Hoefer Mfg. Co.	204
Holman Reamer Co.	204
Hones, Inc., Charles A.	148
Horton & Son Co., E.	60
International Nickel Co	169
International Screw Co.	146
Jacobs Mfg. Co.	183
Jefferson Machine Tool Co.	192
Johnson Machine Co., Carlyle	172
Johnson Tool Co., Inc.	234
Jones & Lamson Machine Co.	6, 7
Kearney & Trecker Corp.	20, 21
Kempsmith Machine Co.	37
Kent-Owens Machine Co.	215
Kingsbury Machine Tool Corp.	47
Knight Machinery Co., W. B.	213
Kux Machine Co	180
L-W Chuck Co.	186
Lamson & Sessions Co.	146
Landis Machine Co.	14, 15
Landis Tool Co.	18, 19
LeBlond Machine Tool Co., R. K.	49
Lees-Bradner Co.	36
Leland Gifford Co	206
Lempco Products, Inc.	235
Lincoln Electric Co.	147
Lindberg Engineering Co.	153
Link-Belt Co.	154
Linley Bros. Co	212
Lodge & Shipley Machine Tool Co.	131

ADVERTISERS INDEX

(Continued from preceding page)

	Page
Lucas Machine Tool Co.	206
Luers, J. Milton	230
McCaskey Register Co	209
McGraw-Hill Book Co., Inc	164, 166, 234
McKay Co.	141
McKenna Metals Co.	125
Macklin Co.	203
Meehanite Research Institute	159
Meisel Press Mfg. Co.	174
Metal Carbides Corp.	150
Metal Textile Corp.	180
Metro Tool & Gage Co.	59
Micromatic Hone Corp	68
Mid-West Abrasive Co	45
Millholland Machinery Co.	208
Mitts & Merrill	222
Modern Tool Works	205
Mollart Engineering Co., Ltd.	170
Monarch Machine Tool Co.	24, 25
Morey Machinery Co., Inc.	196, 214 220, 222
Morris Machine Tool Co.	74
Morse Chain Co.	152
Morse Twist Drill & Machine Co.	191
Murchey Machine & Tool Co	226
National Lock Washer Co.	179
National Machine Tool Co.	214
National Refining Co.	157
National Screw & Mfg. Co.	146
Newark Gear Cutting Machine Co.	174
New Britain-Gridley Div. New Britain Machine Co.	3rd Cover
New England Screw Co.	146
Nichols & Sons, W. H.	218
Nicholson & Co., W. H.	204
Nilson Machine Co., A. H.	158
Noble & Westbrook Mfg. Co.	144
Norton Co.	22, 23
Oakite Products, Inc.	150
Ohio Machine Tool Co.	64
Oliver Instrument Co	224
Osborn Manufacturing Co.	201
Park Chemical Co	50
Parker Co., Charles	146
Parker-Kalon Corp.	146
Pawtucket Screw Co.	146
Pheoll Mfg. Co	146
Philadelphia Gear Works	171
Phillips Screw Mfgrs.	146
Porter Inc., H. K.	223
Porter-McLeod Machine Tool Co., Inc.	224
Potter & Johnston Machine Co.	43
Production Machine Co.	198
Producto Machine Co.	228
Quaker Chemical Products Corp.	123
Quaker City Gear Works	172
Randall & Stickney	234
Reading Screw Co.	146
Ready Tool Co.	194
Reed-Prentice Corp.	180
Reeves Brothers, Inc.	230
Reliance Elec. & Engineering Co.	165
Revere Copper & Brass, Inc	121
Rickert-Shafer Co.	232
Rivett Lathe & Grinder, Inc.	42
Roberts Rubber Co., Weldon	149
Russell, Burdsall & Ward Bolt & Nut Co.	146
Ruthman Machinery Co.	180
Ryerson & Son, Inc., Jos. G.	135
Schauer Machine Co.	196
Scherr Co., Inc., George	28
Scovill Manufacturing Co.	146
Shakeproof, Inc.	146
Shore Instrument & Mfg. Co., Inc.	196
Sier-Bath Gear Co.	175
Simmons Machine Tool Corp.	190
Simonds Worden White Co.	200
Smallpeice Ltd.	181
Smit & Sons, Inc., J. K.	148
Smith & Mills Co.	222
Smith Tool & Engineering Co.	210
Sommerfeld Machine Co.	176
South Bend Lathe Works	46
Southington Hardware Mfg. Co.	146
Sparks Machine Tool Corp.	31
Springfield Machine Tool Co.	196
Standard Conveyor Co.	138
Standard Electrical Tool Co.	202
Standard Gage Co., Inc	54
Standard Pressed Steel Co.	180
State Manufacturing & Construction Co.	232
Steelweld Machy. Div. Cleveland Crane & Engrg. Co.	221
Sterling Grinding Wheel Div.	187
Stow Mfg. Co.	230
Stuart Oil Co., D. A.	148
Sturdimatic Tool Co.	198
Sun Oil Co.	70
Tide Water Associated Oil Co.	160, 161
Timken Roller Bearing Co. (Steel & Tube Div.)	4th Cover, 48
Tomkins-Johnson Co.	178
Torrington Co.	127, 224
Trundle Engineering Co.	136
Ultra-Lap Machine Co.	200
Union Carbide & Carbon Corp	195
Union Twist Drill Co	30
Universal Boring Machine Co.	206
V. & O. Press Co., Inc.	234
Van Keuren Co.	55
Van Norman Machine Tool Co.	12, 13
Vickers, Inc.	139
Walker Co., Inc., O. S.	194
Waltham Machine Works	216
Weatherhead Co.	144
Warner & Swasey Co.	72
Webber Gage Co.	114
Westinghouse Air Brake Co	162, 163
Wheel Trueing Tool Co.	214
Whitney Screw Corp.	146
Wickes Brothers	185
Wilson Mechanical Inst. Co., Inc.	230
Wright Mfg. Div. American Chain & Cable Co., Inc.	164
Zeh & Hahnemann Co	224

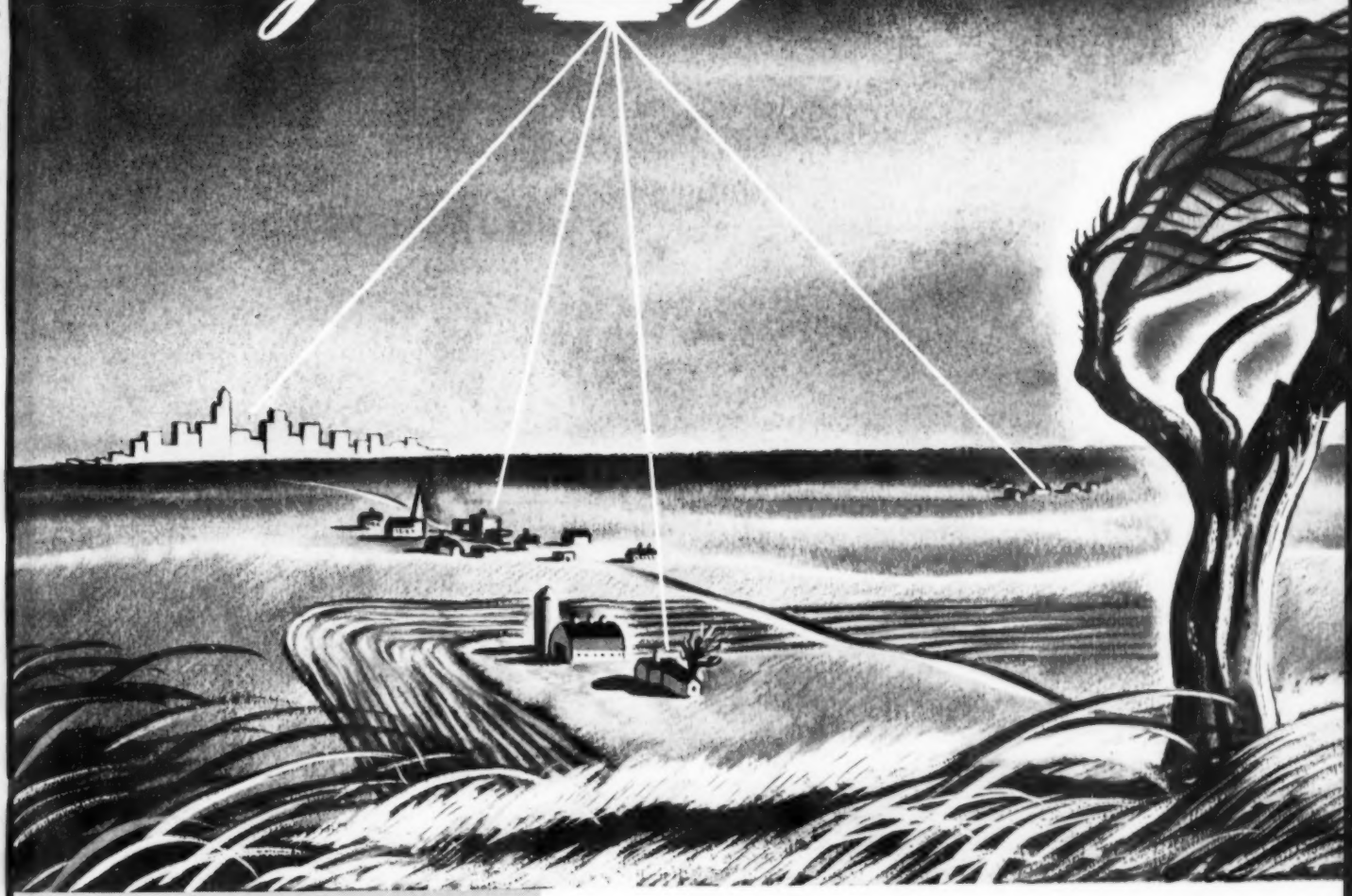
■

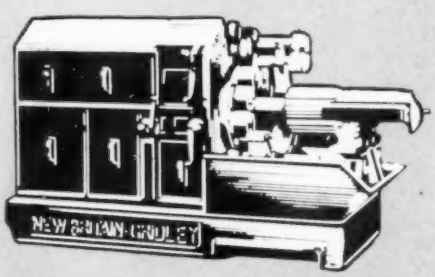
SEARCHLIGHT SECTION

Classified Advertising

Classification	Page
BOOKS	236
BUSINESS OPPORTUNITIES	236
CONTRACT WORK SECTION	237
Agerstrand Corp.	237
Cullon, Austin P.	237
Eastern Tool & Mfg. Co	237
Empire Engineering	237
Essex Machine Works	237
General Pattern Works	237
Greist Mfg. Co.	237
King Foundries, Inc.	237
Kirk & Blum Mfg. Co.	237
Nilson Machine Co., A. H.	237
Reed Machine & Tool Eng.	237
Reliance Machine & Mfg. Co.	237
Thomas & Skinner Steel Products Co.	237
PATENT ATTORNEY	236
POSITIONS VACANT	236
POSITIONS WANTED	236
REBUILDING SERVICE	241, 243, 244
Hill-Clarke Machy. Co.	244
Indianapolis Machinery & Supply Co., Inc.	243
Simmons Machine Tool Corp.	241
SELLING OPPORTUNITIES	241
WANTED TO PURCHASE	236
USED SURPLUS EQUIPMENT	236-244
Aaron Machinery Co.	238
Adams, Ogden R.	244
American Welding & Mfg. Co.	244
Balcrank, Inc.	242
Beal & Co., Joseph	242
Botwinik Bros. of Mass. Inc.	242
Canal Machinery Co.	242
Cincinnati Machinery & Supply Co.	240
Crowley Co., John A.	244
DeWitt Tool Co.	242
Dony Machinery Co., D. E.	240
Eastern Machinery Co.	243
Emerman & Co., Louis E.	240
Eveready Electric & Supply Co.	244
Falk Machinery Co.	239
Hill-Clarke Machinery Co.	238-244
Hyman & Son, Joseph	240
Indianapolis Machinery & Supply Co.	243
Lang Co.	240
Miles Machinery Co.	240
Morey Machinery Co., Inc.	243
Osborne & Sexton Machinery Co.	244
Ott Machinery Sales, Inc.	244
Rosenkranz Machinery Co.	244
Saunders Machinery Exchange	244
Simmons Machine Tool Corp.	241
S & S Machinery Co.	242
Standard Machinery & Supply Co.	244
Strong Carlisle & Hammond Co.	242
West Penn Machinery Co.	242
Wigglesworth Machinery Co.	244
Zeeve & Co., Alex.	242

This War Belongs to Every American





● We didn't want it, but the enemy foolishly insisted on it. Now he has one hundred and fifty million fighting Americans to cope with . . . Americans who have made this their *personal* war. That was the enemy's *fatal* mistake.

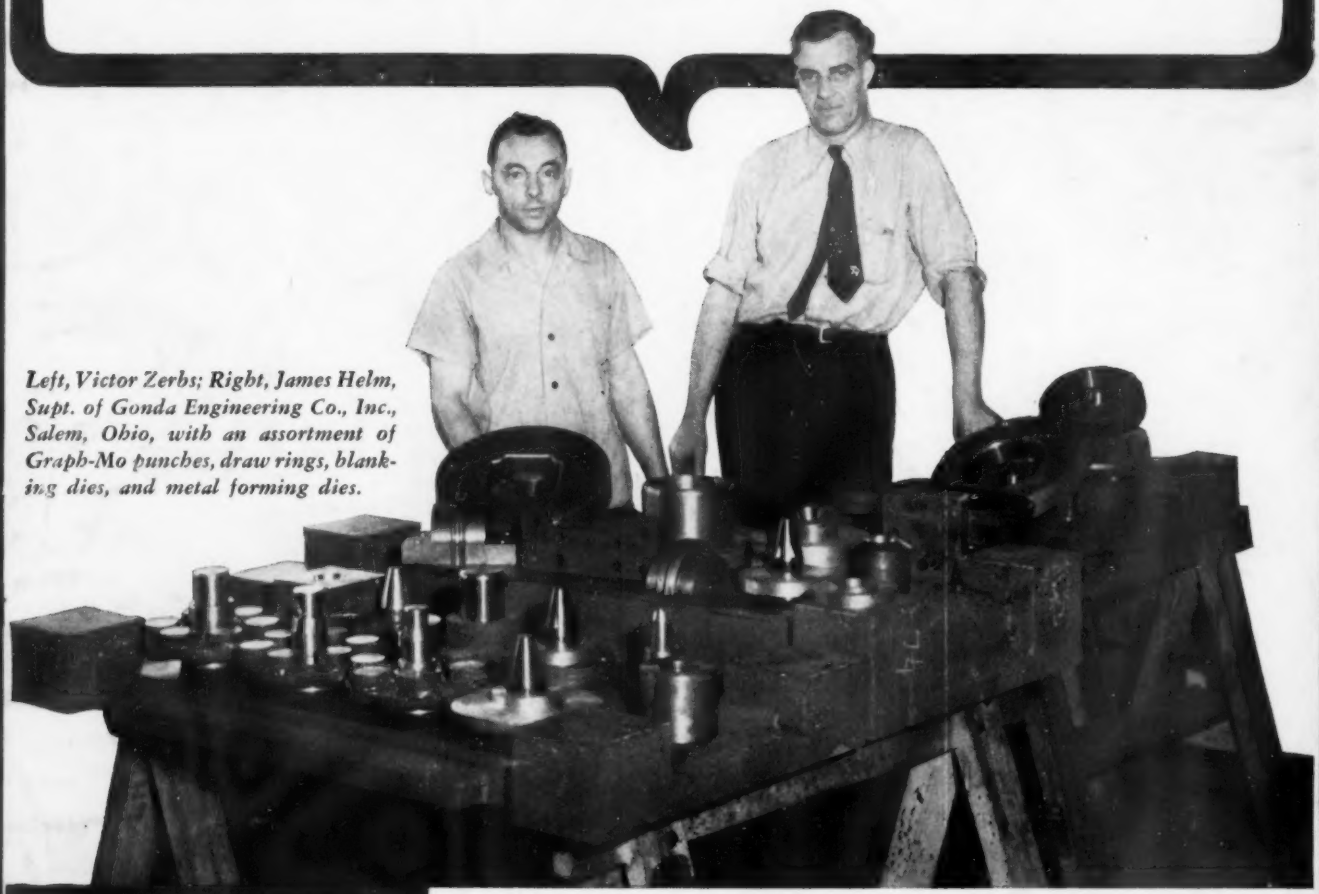
But let's not be smug about it, the war is not yet won by any means. You and we have a specially important job to do. We must produce *more* materials with *less* waste. We must wage war on absenteeism. We must help recruit more eligible workers. We must do *everything* we can to make the enemy feel the force of ALL America at war.

NEW BRITAIN-GRIDLEY • MACHINE DIVISION

THE NEW BRITAIN MACHINE CO. • NEW BRITAIN, CONN.

NEW BRITAIN AUTOMATICS

"GRAPHITIC STEEL has less tendency to scuff and score," *Says Gonda Engineer*



Left, Victor Zerbs; Right, James Helm, Supt. of Gonda Engineering Co., Inc., Salem, Ohio, with an assortment of Graph-Mo punches, draw rings, blanking dies, and metal forming dies.

Supt. James Helm of The Gonda Engineering Company, Inc., Salem, Ohio, has used Graphitic Steel ever since it was first introduced five years ago. "Companies for whom we make a wide variety of dies report better wear from Graphitic Steel and less tendency to scuff and score than other oil-hardening tool steels," says Mr. Helm. "Furthermore, we encounter very little distortion when hardening Graphitic Steel

"Its machinability is excellent," he adds, "and is an outstanding reason for our adoption of Graphitic."

TIMKEN
TRADE MARK REG. U.S. PAT. OFF.
GRAPHITIC STEELS

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO
Steel and Tube Division